AD-A071 397 WYLE LABS HUNTSVILLE ALA F/G 13/10
RECREATIONAL BOATING SAFETY EDUCATION METHODOLOGY (RBSEM).(U)
APR 79 E SAGER, K GEISSLER, K REDICK, S COHEN DOT-CG-73433-A
UNCLASSIFIED MSR-79-01 USCG-D-37-79 NL

1 OF 4
AD
A071397

LEVEL II

Report No. CG-D-37-79

RECREATIONAL BOATING SAFETY EDUCATION METHODOLOGY (RBSEM)
PHASE I

Wyle Laboratories
7800 Governors Drive, West
Huntsville, AL 35807

FINAL REPORT

APRIL 1979

AD A071397

DDC FILE COPY

DDC
RECEIVED
JUL 19 1979
D

Document is available to the U.S. public through the
National Technical Information Service,
Springfield, Virginia 22161.

Prepared for

U. S. DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD
Office of Research and Development
Washington, D.C. 20590

79 07 17 016

NOTICE

THIS DOCUMENT IS DISSEMINATED UNDER THE SPONSORSHIP OF THE DEPARTMENT OF TRANSPORTATION IN THE INTEREST OF INFORMATION EXCHANGE. THE UNITED STATES GOVERNMENT ASSUMES NO LIABILITY FOR THE CONTENTS OR USE THEREOF.

THE UNITED STATES GOVERNMENT DOES NOT ENDORSE PRODUCTS OR MANUFACTURERS. TRADE OR MANUFACTURERS' NAMES APPEAR HEREIN SOLELY BECAUSE THEY ARE CONSIDERED ESSENTIAL TO THE OBJECT OF THIS REPORT.

Technical Report Documentation Page

1. Report No. USCG-D-37-79	2. Government Accession No.	3. Recipient's Catalog No.

4. Title and Subtitle

RECREATIONAL BOATING SAFETY EDUCATION METHODOLOGY (RBSEM). ~~PHASE I~~

5. Report Date: April 1979

222p

6. Performing Organization Code

7. Author(s)

E. Sager, K. Geissler, K. Redick, S. Cohen, N. Whatley

8. Performing Organization Report No.: MSR-79-01

9. Performing Organization Name and Address

WYLE LABORATORIES
7800 Governors Drive West
P. O. Box 1008
Huntsville, AL 35807

10. Work Unit No. (TRAIS)

11. Contract or Grant No.: DOT-CG-73433-A

12. Sponsoring Agency Name and Address

Department of Transportation
United States Coast Guard
Office of Research and Development
Washington, DC 20590

13. Type of Report and Period Covered: Final Report, December 1977 - April 1979

14. Sponsoring Agency Code: G-DSA

Phase 1

15. Supplementary Notes

16. Abstract

The data management system presented in this report is intended for use by U.S. Coast Guard personnel in developing recreational boating safety education programs. RBSEM provides an integrated approach which involves computerized, manual, and interactive operations, with substantial judgemental input by Coast Guard personnel at several stages. A specialized data file is constructed by drawing a sample of accidents from the current Coast Guard boating accident file. The sampled accidents are subjected to several analytical procedures. Fault trees are used to identify accident initiators. Documentation for the revision of existent cause analysis trees and for the development of new trees for four additional accident types is included. The accidents are reviewed to determine the presence of "associated factors" (events and conditions related, though not necessarily in direct causal fashion, to accident occurrence). Operator alternatives (behaviors which might have averted or mitigated the severity of the accident) are identified. Accident types and causes, and associated factors, are ranked according to several severity criteria, using a weighting procedure to take into account multiple-boat accidents. Accident causes are assessed to determine their potential for successful educational intervention. The operator alternatives for the chosen accident causes are then used to formulate educational objectives for education programs. Objectives are also prepared for the chosen associated factors. Operator demographic data and other available information for the chosen groups of accidents are used to supply guidelines for the preparation of the education programs. This report consists of procedural descriptions and information necessary to implement this RBSEM system.

17. Key Words	18. Distribution Statement
Recreational Boating Safety Education; Data Management System; Accident Cause Analysis; Safety; Education; Boating; Pleasure Boating; Accident Prevention	Document is available to the public through the National Technical Information Service, Springfield, Virginia 22161

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
Unclassified	Unclassified		

Form DOT F 1700.7 (8-72) Reproduction of completed page authorized

405950

1B

METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
		LENGTH		
in	inches	*2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
		AREA		
in^2	square inches	6.5	square centimeters	cm^2
ft^2	square feet	0.09	square meters	m^2
yd^2	square yards	0.8	square meters	m^2
mi^2	square miles	2.6	square kilometers	km^2
	acres	0.4	hectares	ha
		MASS (weight)		
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
		VOLUME		
tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.95	liters	l
gal	gallons	3.8	liters	l
ft^3	cubic feet	0.03	cubic meters	m^3
yd^3	cubic yards	0.76	cubic meters	m^3
		TEMPERATURE (exact)		
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

*1 in = 2.54 (exactly).

Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
		LENGTH		
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
		AREA		
cm^2	square centimeters	0.16	square inches	in^2
m^2	square meters	1.2	square yards	yd^2
km^2	square kilometers	0.4	square miles	mi^2
ha	hectares (10,000 m^2)	2.5	acres	
		MASS (weight)		
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	
		VOLUME		
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.26	gallons	gal
m^3	cubic meters	35	cubic feet	ft^3
m^3	cubic meters	1.3	cubic yards	yd^3
		TEMPERATURE (exact)		
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F

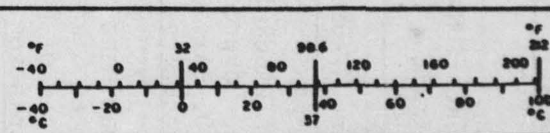


TABLE OF CONTENTS

TABLE OF CONTENTS (continued)

TABLE OF CONTENTS (continued)

TABLE OF CONTENTS (concluded)

ATTACHMENT A contains program listings for computer system (bound under separate cover)

Accession For	
NTIS GRA&I	☒
DDC TAB	☐
Unannounced	☐
Justification	
By	
Distribution/	
Availability Codes	
Dist	Avail and/or special
A	

RECREATIONAL BOATING SAFETY EDUCATION METHODOLOGY (RBSEM) - PHASE I

1.0 INTRODUCTION AND EXECUTIVE SUMMARY

Previous research conducted by Wyle Laboratories for the Coast Guard (References 1, 2, and 3) resulted in the description of a systematic method of developing education programs which are based on an analysis of accident data. This system involves taking information from accident reports to identify 1) causes and other contributory ("associated") factors which are responsible for the accidents, 2) behaviors on the part of boaters which would have averted or attenuated the accidents, and 3) demographic information about the operators of the accident boats. High priority areas are established by analysis of the data according to criteria based on frequency and severity; and according to their suitability for education, i.e., whether or not an education program would be likely to change the behaviors involved. When priority areas have been chosen, the operator alternative behaviors which were identified for those accidents are used to generate objectives for the educational effort. The demographic data is used to supply guidelines for producing and disseminating the educational materials.

The reports cited also addressed the actual design of the education program in terms of media techniques, message content and format, and delivery systems. Finally, prototype material was developed for an illustrative program.

The present project follows directly from the previous effort. In this report, a data management system is described which streamlines and refines the procedures developed in the previous work; expands its capability in terms of accident types for which analysis instrumentation has been developed; and most importantly, automates a significant portion of the process by means of computer. As the number of reported accidents increases yearly, such automation becomes increasingly essential to the success of education programs. This system has the advantage of being designed to make use of information already present in the existent Coast Guard accident data base. It also allows Coast Guard personnel to make judgemental input at various steps in the operational procedure. Thus it provides an effective integrated system which is highly automated, but is ultimately based on Coast Guard policy and judgment.

The data management system comprises three separate stages of development:

- construction of a specialized coded file of boating accident records that will provide the information required for RBSEM
- analysis of information acquired in the specialized file that identifies accident types, accident initiators, and associated factors warranting educational countermeasures
- analysis of information acquired in the specialized file that provides the specification of precise, behavioral objectives for educational countermeasures.

Six kinds of information are output:

- identification of accident types for educational countermeasures that are occurring frequently on nationwide or regional (district) levels,
- identification of accident initiators that are amenable to educational countermeasures,
- identification of factors associated with frequently occurring types of accidents (these factors often play a contributory rather than a direct causal role),
- determination of priority rankings of accident initiators, and associated factors, according to five selected severity criteria,
- specification of demographic characteristics of those members of the recreational boater population who were involved in accidents,
- determination of operator alternatives which would have prevented the accidents or would have facilitated recovery of all persons without injury or death; which are the direct source for determination of educational objectives for specific programs, media efforts, etc.

The system covers four general groups of accident types and within these, 12 subclassifications for which cause analysis instruments have been developed. Because of similarities of specific accident classifications, only seven separate instruments were required. The general and specific accident types are listed in

Figure 1. An additional classification of accident type which is included in the Coast Guard's Boating Statistics (CG-357) is that of "Other Casualty and Unknown." A substantial number of reported accidents fall into this classification. The construction of a cause analysis instrument of the type used here for a catch-all category of this nature represents some unique difficulties. In view of the scope of the present effort, this task was not undertaken. Since the RBSEM system is structured in such a way that cause identification is an initial step in the process the category is not included in the data management system. If, in the future, the accidents in this group prove to represent unique problems which are not being addressed by the RBSEM program, the Coast Guard may wish to undertake the effort of developing a means for inclusion of the "Other; Unknown" category in the RBSEM system.

RBSEM utilizes boating accident information that has been accumulated on a yearly basis from the U. S. Coast Guard accident reporting system. These data have been collected on a national level using Boating Accident Reports (BARs) and Marine Inspection Officer reports (MIOs), in-depth information provided from on-the-scene accident investigations, and supporting information such as the Nationwide Boating Survey (NBS). It is suggested that on-line utilization of RBSEM employ the most recent year-end data for developing the future education programs.

Section 2.0 describes the procedures used in the development of the accident cause analysis instrumentation which is used in the RBSEM system. This includes a general discussion of accident modeling; description of the instrumentation developed in previous work, and the revisions which were made to it for the current program; and a report on the new models which were created for four additional accident types for this program. Also included in Section 2.0 is a discussion of the procedures for assessing the "associated factors" (i.e., conditions or events frequently associated with, but usually not directly the cause of, accidents).

Section 3.0 is the exposition of the RBSEM data management system, including descriptions of the various operations involved, an overview of the procedures used to accomplish these operations; identification of the manual, computerized, and interactive functions; and designation of the personnel required for the different tasks.

ACCIDENT GROUP		
Collision Accidents	• Groundings (boats run aground) • Collisions with other vessel • Collisions with fixed objects • Collisions with floating objects	Cause Analysis Instrumentation Revised
Loading Related Accidents	• Capsizings • Flooding or swampings • Sinkings • Falls overboard	
Fire and Explosion Accidents	• Fires and/or explosions of fuel on the boat • Fires and/or explosions on the boat other than fuel	New Cause Analysis Instrumentation Developed
Other Categories	• Falls taken by persons within the boat • Injuries or fatalities resulting from persons being struck by a boat or by a propeller	

FIGURE 1. RECREATIONAL BOATING ACCIDENTS BY MAJOR GROUPING AND SPECIFIC TYPES

The procedure can be divided into three basic stages: the construction of the data file (section 3.2); the choice of accident initiators and associated factors for the education program (section 3.3); and the specification of objectives (section 3.4) and guidelines (section 3.5) for the education program.

A great deal of material has been placed in appendix form. This is because the essence of this report is to present a usable methodology for the Coast Guard to follow in the implementation of future education programs. Certain materials are utilized at more than one stage of the analysis, and by referring the user to an appendix, repetitious reproduction of the material is avoided. Secondly, this appendix format provides discrete packages which are more readily accessed by the user than would be the case if they appeared in the narrative body of the report.

Key items in the report which offer systematic outlines of the RBSEM process are:

- Figure 3 (data file construction, page 20)

- Figure 5 (choice of initiator s and associated factors for education, page 34)
- Figure 6 (specification of objectives and guidelines, page 42)
- Appendix F (list of operations which are performed by the three types of personnel involved in implementing the program).

The results of this data management system are to be used to develop the actual message content and the structure of education programs in Phase II of RBSEM. The system is a tool designed to aid the Coast Guard in producing specific educational countermeasures with high potential for cost-effective achievement of greater safety for recreational boaters.

2.0 CAUSE ANALYSIS METHODOLOGY AND INSTRUMENTATION

The purpose of accident cause analysis procedures is to identify as precisely as possible the problems directly associated with the accidents under consideration. Cause analysis of any given accident type serves to clarify the interrelation of boating conditions and boater behaviors that occurred prior to or during the accident. Cause analysis information is used to identify the events, behavioral or otherwise, that directly or indirectly initiated the accident.

There are two major elements or components of cause analysis instruments: the relevant events or operations that are the subject of analysis, and denotation of the relationship between these events. Graphic representation is used to describe this model. The term generally given to this graphic representation is the "cause analysis tree." The principal cause analysis instrumentation for RBSEM is an adaptation of these trees to recreational boating accidents, and consists of probable causes, related or salient behaviors, and associated conditions.

Typically a cause analysis tree is constructed in such a way that the top consists of a minimal number of general causes and *grows* downward into a larger number of more specific causes. The specific causes are identified in blocks that usually contain the name of the cause, code numbers for the cause, and the number of accidents associated with that block. The relationships between the causes are shown by junctions of lines of definition. The graphic illustration of the tree is typically supplemented with verbal descriptions of the causes presented in the various branching legs of the tree. The more complete the information is about the accident being analyzed, the farther down into specific branches and blocks the accident can be traced by the analyst, and consequently, the more complete the understanding of the accident is. In its simplest form, a tree with minimal components is depicted in Figure 2.

The procedure for development of cause analysis instrumentation in the past for U. S. Coast Guard research resembles that used in the construction of "fault trees." Fault trees are part of the methodology for systems analysis of various complex problems and operations. Such systems analysis is described in considerable detail in <u>A Fault Tree Manual</u>, T. W. Delong, (Reference 4), which served as a principal resource for the current Wyle cause analysis instrumentation.

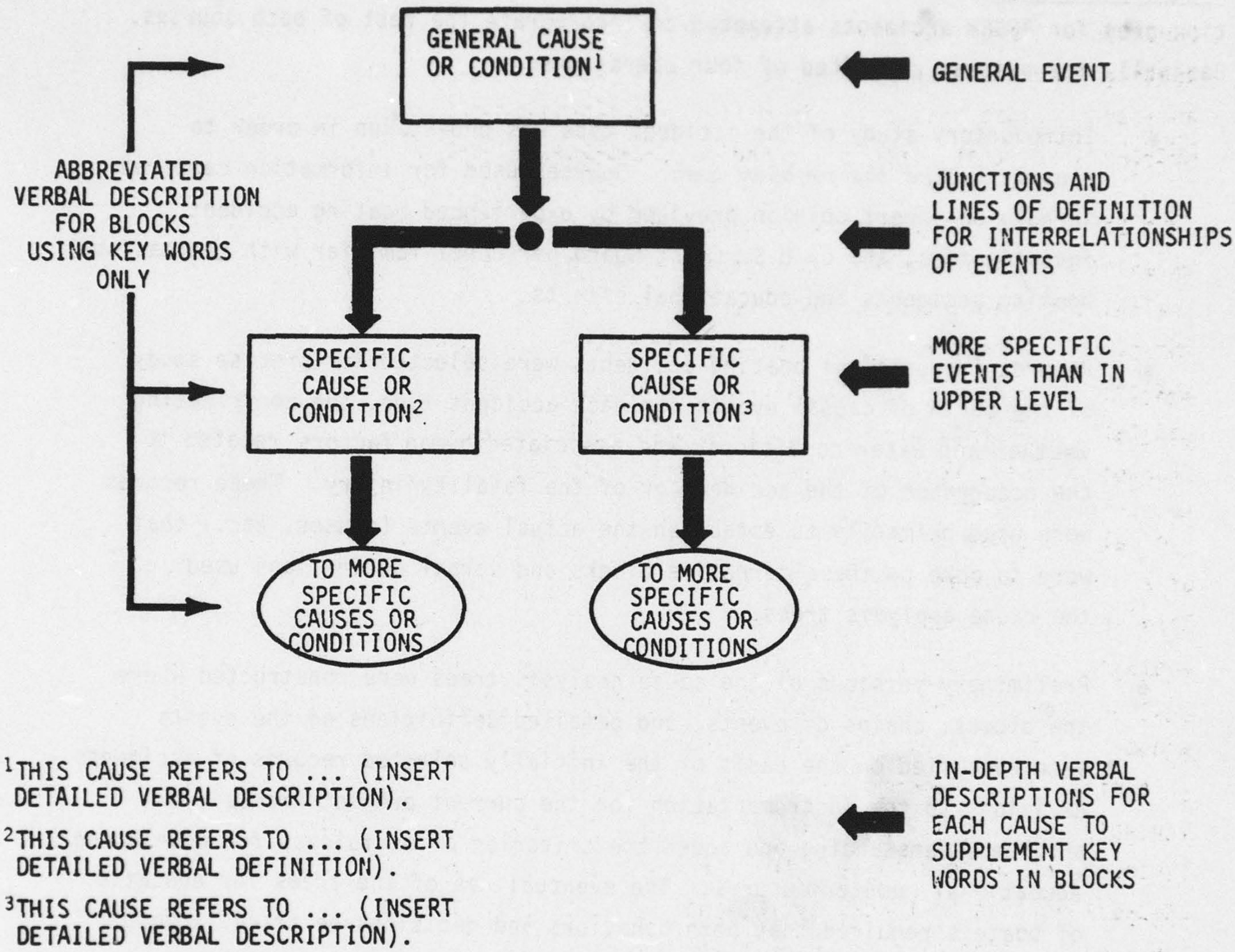


FIGURE 2. MINIMAL COMPONENTS OF A CAUSE ANALYSIS TREE

Additional discussion regarding development of a similar concept, accident profile modeling, is available in S. Cohen, et al., Regulatory Effectiveness Methodology, Phase II Research (Reference 5). The procedure for development of the instrumentation used for RBSEM accidents attempted to incorporate the best of both sources. Basically the process consisted of four operations:

- Introductory study of the accident type was undertaken in order to clearly *define the problem area.* Sources used for information centered largely on expert opinion provided by experienced boating accident investigators, and by U.S. Coast Guard personnel familiar with recreational boating accidents and educational efforts.

- Records (reports) of boating accidents were selected for precise study of the chain of causal events for each accident type, the contributing weather and water conditions, and associated human factors related to the occurrence of the accident or of the fatality/injury. These records were used primarily to establish the actual events (causes, etc.) that were to make up the alternative blocks and verbal definitions used in the cause analysis trees.

- Preliminary versions of the cause analysis trees were constructed where the blocks, chains of events, and detailed definitions of the events were specified on the basis of the initially selected records of accidents. Revisions to the instrumentation for the current project emphasized problem understanding and added the criterion of usefulness for developing educational countermeasures. The eventual use of the trees for education of boaters required that both behaviors and decisions be traced through the accident (at least as much as possible), in order to establish educational objectives for programs. Then, a sample of accident records was recorded in the trees by two persons independently of the analyst who initially constructed the tree. Emphasis in reviewing the recording of the sample of accidents was directed to reliability of the entries in the blocks and representativeness of the various blocks (events), and chains of blocks, for all possible accident occurrences.

Revisions were made to the trees in order to facilitate later reliability and representativeness when the instrumentation is used by actual U. S. Coast Guard boating accident coders. These revisions were undertaken

after comparison of coding by the coders and the analyst, and consisted of adding, deleting, or combining various events in the trees; changing a chain of events; or modifying detailed definitions of the events.

2.1 Development of Cause Analysis Instrumentation for RBSEM

2.1.1 Collision and Loading Related Accident Instrumentation

The development of cause analysis instrumentation for collisions and loading related accidents was in two stages. Initially, trees were developed for those accidents in order to accomplish U.S. Coast Guard problem identification research for each accident group respectively. Those trees provided valuable information concerning the understanding of a given accident type from an engineering point of view. The outcome of the earlier efforts provided information for standards development, boat design guidelines, and law enforcement.

Optimal use of the instrumentation for educational program planning necessitated revisions to the earlier trees. These revisions were made to identify more clearly the human behavior contributing to the accident (since educational efforts are directed at modifying human behavior). The sample of accident reports used for the development of the collision and loading related accident trees, and the construction of those trees were described in the previous problem identification studies (see Reference 2 for collision accidents and Reference 3 for loading related accidents). Sources for the accident records used consisted of the customary Boating Accident Reports (BARs), Marine Inspection Officer reports (MIOs), and on site, in-depth accident investigations conducted by Wyle accident investigators. As a rule of thumb, the attempt was made to select accidents according to the completeness of the written report of the accident as well as for representativeness of causes and the chains of salient events. Consequently, there were larger proportions of fatal accidents for the years represented, since fatal accidents are more completely and more accurately reported.

It is important to note the differences here between a sample of accidents being representative in terms of the *relative proportions of occurrence*, and in terms of representation for all possibilities of accident causes, conditions, and outcomes. Emphasis for the current effort was given to representing all reasonable causes that were useful for development of the instrumentation. Relative

frequencies of occurrence of accidents, etc., can be made directly from summary statistics that are based on all boating accidents rather than a sample. In short, representation of all alternative types, causes, etc., took a priority over representation of proportions of relative cause occurrences, since the latter offered information of no real value for program planning.

2.1.2 Revisions for Cause Analysis Instrumentation for Collision Accidents and Loading Related Accidents*

The cause analysis tree devised for the analysis of all types of collision accidents, i.e., groundings, collision with boats, collision with fixed objects, and collision with floating objects was revised by deleting one entire branch of the tree. The original cause identification tree made extensive provision for analysis of accidents where the boat being detailed was not underway at the time of impact. Since it is likely that most boaters in these boats could not have avoided the accident regardless of preparation, etc., a thorough analysis of these reports was not pursued. However; analysis is intended for the records of boats underway that hit a boat not underway. Otherwise, the analysis tree for boats underway was sufficiently flexible that it permitted adequate understanding of operator behavior in the accident situation for educational purposes. The revised collision tree prepared for RBSEM is presented in Appendix A-1. This tree is conceptually the same as that used in the Wyle collision education project (Reference 2). The list of verbal definitions for each of the initiators in the blocks shown remain identical to the original collision tree. The definitions are presented in Appendix A-2.

---

*The collision accident is one of four types of accident occurrences. These four accidents are: grounding of the boat, colliding of one boat with another boat, impacting of the boat with a fixed object in the water such as a breakwater, and impacting of the boat with a floating object such as a log. The identification of the accident type is based upon the first impact that damaged the craft (or caused personal injury/death), or set into motion the chain of events that subsequently caused the damage, injury, or death.

The loading related accident is one of four types of accident occurrences. These four accidents are: capsizings, swampings or floodings, sinkings, and falls overboard. The accidents are all related to the boat's stability, freeboard, capacity, and motion characteristics. Capsizings, swampings/floodings, and sinkings are identified by the final configuration of the boat subsequent to the occurrence of the accident but prior to recovery operations initiated by assisting boaters, etc.

The cause analysis instrumentation for loading related accidents required the development of two separate trees for the original problem identification study (Reference 7). One tree was constructed for the analysis of capsizings, swampings/floodings, [and sinkings]; the other tree was constructed for falls overboard. Again, the current revision to these trees was intended to duplicate their use in the Wyle loading related education project (Reference 3). The educational project required that all wave (and wake) initiated accidents be combined regardless of whether they first caused a shift of load in the boat which then caused the capsizing, etc., or whether they caused the accident directly. It was believed that educational accident avoidance behavior would be the same for the direct or indirect effect of the initiators. The revised instrumentation for the current project provides additional chains of blocks which should simplify any future need for grouping combinations of the initiators. In the falls overboard tree, several blocks for activities of operators, or persons on board prior to the accident were changed to provide uniform consistency throughout those alternatives, and to more accurately adhere to the original logic of the trees. The trees prepared for RBSEM and the verbal definitions which accompany them are presented in Appendices A-3 and A-4 (capsizing, etc.), and Appendices A-5 and A-6 (falls overboard). It should be noted that the verbal definitions correspond, where possible, to those originally used in the cause identification research.

2.1.3 Development of New Cause Analysis Instrumentation

Cause analysis instrumentation was developed for four additional accident types for which models had not previously been created. Although these accident types occur less often than the collision or loading related accidents, they were included in RBSEM to provide continuity and uniformity in analysis for all U.S. Coast Guard recreational boating accident classifications (with the exception of the "Other; Unknown" category). The additional accidents are:

- fires and/or explosions of fuel on the boat
- fires and/or explosions on the boat other than fuel
- falls taken by persons within the boat
- injuries or fatalities resulting from persons being struck by a boat or by a propeller.

Separate cause analysis instrumentation was developed for each of the four accident types. Methods used to develop the new instrumentation paralleled those used in the previous research. To begin, several Wyle researchers with a good knowledge of the available data sources were consulted. Then, various accident reports were collected from sources available at Wyle for both fatal and nonfatal boat accidents.* It is believed that these sources provided all the information needed to develop suitable cause identification instruments. The sources and numbers of these reports are presented in Table 1. The total number of accidents considered during the construction (and evaluation) of the trees is shown in the last column of Table 1. To give some indication of the sample size relative to the population of reported accidents of these types, the sample size is expressed as a proportion of the total number of reported accidents given for 1975 in CG-357. Thus, in terms of numbers of accidents, sample size for this effort included the equivalent of 27% of 1975 fire/explosion of fuel reports, 40% of fire/explosion other than fuel; 52% of falls within the boat; and 19% of struck by boat or propeller.

The cause identification instruments were constructed mainly from the information provided by BARs and the WATS Accident Alert reports. In-depth accident reports were included in the fire/explosion categories. Most of the BARs were taken from those used in the Accident Recovery Model (ARM) (Reference 8), and from Powering Related Accident Model (PRAM) (Reference 9). An additional group of BARs was used for the preliminary evaluation of the trees (a validation procedure to insure adequacy of the instrumentation). The reports range in time from the years 1969 to 1977, but most were from 1975.

After the trees had been constructed, an evaluation was undertaken to test reliability and completeness of the new instrumentation. Two persons with extensive experience in coding boating accidents were given the entire set of BARs to code

* To reiterate an earlier point, it was not considered necessary to construct the cause analysis instruments from a sample reflecting all parameters of the population of recreational boating accidents. What was needed was knowledge about the kinds of accident causes, and the consequences of actions taken by persons involved for each type of accident. The number of times such alternative actions occurred in the population of accidents was inconsequential at this stage of the analysis.

TABLE 1. SOURCES FOR DATA BASE USED TO DEVELOP NEW CAUSE ANALYSIS INSTRUMENTATION FOR RBSEM

Type of Accident Report, Year of Accident, Number of Reports, and References									
Accident Category	No.	In-Depth Reports	No.	BARs	No.	WATS Reports	Additional BARs Used In The Validation Procedure No.		Total
Fires/Explosions of Fuel	16	(1970)* Reference 10	7	(1975) Reference 8	56	(1975) Reference 13	1	(1973)	128
	11	(1973) Reference 11					23	(1976)	
	6	(1975) Reference 12					4	(1977)	
	4	(1976) Reference 12							
Fires/Explosions Other Than Fuel	Selected information from the above sources also considered here.		1	(1977) Reference 8	22	(1975) Reference 13	2	(1973)	28
							3	(1976)	
Falls Within the Boat			7	(1975) Reference 8			1	(1973)	25
			14	(1975) Reference 9			2	(1976)	
							1	(1977)	
Persons Hit by Boat or Propeller			5	(1975) Reference 8	3	(1975) Reference 14	2	(1969)	25
			1	(1977) Reference 8			8	(1976)	
			5	(1975) Reference 9			1	(1977)	

*Year refers to date of accident and not to the publication of the reference.

through the new trees. BARs included those which had been analyzed for the construction of the trees (from ARM and PRAM), and additional BARs made available from other research projects. The coders were instructed to assess the new cause analysis trees critically, to note any difficulties, and to recommend improvements. The analyst who originally developed the trees also recoded the set of BARs through the instruments, and the results of the three independent codings were compared. Discrepancies between the three codings were tabulated and resolved. Either one of the coders changed his response, or modifications were made to the cause analysis tree and/or accompanying verbal definitions.

A second task which the coders performed as they considered each accident was the generation of operator alternatives. That is, for each accident the coder was asked to identify, if possible, a behavioral procedure or procedures which might have averted or reduced the severity of, or the consequences of, that particular accident. The resultant list of behavioral alternatives was edited to eliminate repetition and to achieve a uniform format compatible with that used in the earlier work. The operator alternative behaviors are included in a complete list in Appendix D, and will be further discussed in a later section of this report.

The instructions used by the coders and analyst are presented in Appendix B.

The tabulated results of the cause analysis coding operation (after resolution of discrepant coding) were entered into the tree models, and are presented in Appendix C. In the case of the fires and/or explosions of fuel category, it is likely that future use of BARs will produce a higher proportion of accident occurrences in the "boat being fueled" and "boat not being fueled" blocks, as opposed to "unknown...." This is because the large number of fire and explosion accidents used to develop the trees from the WATS Accident Alert Reports often fail to specify whether the boat was being fueled or not.

The new instrumentation and detailed verbal definitions are presented in Appendices A-7, A-8, and A-9 (fires and/or explosions of fuel), Appendices A-10 and A-11 (fires and/or explosions other than fuel), Appendices A-12 and A-13 (falls within the boat), and Appendices A-14 and A-15 (person struck by boat or propeller).

2.2 Associated Factors

The preparation of an educational effort aimed at reduction of boating accidents and boater injuries and fatalities is greatly facilitated by a comprehensive description of the accident situation. In the case of some accidents, a single initiator can be identified as the cause of the accident. However, there may be other behaviors, conditions, or events which are less directly, but still causally related to the accident. They may serve an intermediary role to the direct cause, or they may act as contributory factors. When they are established as present, it can often be inferred that they played a part in causing the accident or increasing its severity. For example, prior alcohol consumption by the boat operator is frequently reported in accident situations, and is known to reduce operator efficiency. Thus, even when some other behavior or factor has been identified as the direct cause, it is likely that alcohol was instrumental in bringing about the accident situation. In other accidents, a combination of factors play direct contributory roles. Singling out one cause, as is required by the cause analysis trees, could result in a loss of valuable information.

To retain the information about these additional factors, a procedure to supplement the cause identification analysis was developed. In the collision research study (Reference 6), a list of questions was developed in the form of a "Human Factors Questionnaire." A number of these items were adapted for the collision education research (Reference 2), and labeled "associated factors." The frequency with which they are reported confirms that it is important to consider them in an educational program. They have been retained for RBSEM use, and are here applicable to all the accident types. Coding instructions for reporting their occurrence are presented in Appendix E. The associated factors are:

- Operator Alcohol Consumption - The operator was known to have consumed alcoholic beverages from an autopsy, tests administered by investigating personnel, or by virtue of the testimony of witnesses.

- Operator Fatigue - The operator was exposed to four or more hours of sunshine and/or significant stressors (such as those listed below). The exposure may have been while boating or during another activity prior to operating the boat.

- Glare - This pertains to reflected sunlight, or any other light source off the surface of the water, or off something on the boat. It also refers to direct glare from the sun, or any other light source. Preliminary research suggests that exposure to glare can have cumulative effects.

- Excessive Shock/Vibration, Noise Levels - The operator was exposed to enough of one or more of these environmental influences that his performance in driving the boat is likely to have been affected. The exposure may have been moderate for a prolonged period of time, or it may have been very high for a shorter period of time. A significant shock/vibration problem can be assumed to result from high speed operation in rough water. Again, preliminary research suggests that these environmental influences (stressors) can have cumulative effects.

- Operator Inattention - The operator simply did not see the other boat or object that he should have seen in time to avoid the accident. Usually, this operator problem will be indicated on the BAR.

- Excessive Speed for Conditions - The operator was travelling at a rate of speed greater than that which was warranted by water conditions, traffic, etc. Excessive speed is information often included in the comments on the BAR. Otherwise, when not specifically stated on the BAR, its association with the accident requires coder judgment.

- Reckless or Malicious Operation - The operator deliberately tried to place his boat in the collision situation (or other accident situation). It may have been because of a dislike for another person involved, or it may have been a careless, mischievous impulse. This information is usually indicated on the BAR.

3.0 PROCEDURES FOR THE RBSEM DATA MANAGEMENT SYSTEM

3.1 Organization of Procedures and Personnel Required for RBSEM

The RBSEM data management procedures are divided into three separate stages:

- construction of a specialized coded file of boating accident records that will provide the information required for RBSEM,

- analysis of information acquired in the special RBSEM accident data file that identifies accident initiators and associated factors that warrant educational countermeasures, i.e., it can be anticipated that education directed toward these initiators and associated factors will be productive, and

- analysis of the information acquired in the special RBSEM accident file that will permit precise specification of educational objectives, and will facilitate specification of guidelines for educational message development, media selection, and message production.

These procedures are intended to be accomplished by U. S. Coast Guard personnel representing three areas of expertise. It would be most desirable if all personnel had prior experience with education program planning for recreational boaters, and with computer assisted data management programs. Specifically, three types of qualifications and tasks are indicated for these persons:

- Computer Support Personnel - Computer support for the RBSEM data management system requires at least one person who has competence in using the Cybernet time sharing system, the SPSS statistical package, and the IS/ATHENA data manager package. The level of skill required will permit use of all RBSEM specific software in the Cybernet system, set up and running of various SPSS crosstabulations and statistical computations, and execution of various IS/ATHENA data management operations such as addition, retrieval, selection, and modification to information in the software prepared for the RBSEM data management system. The computer support personnel are to provide assistance to persons determining education programs.

- Boating Accident Coders - Coder support for the RBSEM data management system requires one or more persons with sufficient background in recreational boating, use of BAR data, and accident/cause analysis that they can reliably make engineering and human factors interpretations of accident reports. The level of skill required will enable coders to determine initiators of accidents, contributory factors, and preventive operator alternatives. In addition, coders will need verbal authority to express descriptions of boating accidents in compressed and economical form. Coders are also intended to provide assistance to persons determining education programs.

- Education Analyst(s) - Education Analyst(s) are responsible for the actual determination of education programs for recreational boaters. They will need prior experience with planning education and/or safety programs for recreational boaters or other recreational areas. The level of skill required will enable the analyst to interact with computer support personnel, and persons responsible for the production/creation of educational materials. Analysts will need familiarity with recreational boating accident data bases, and should have sensitivity to the interests of the boating industry and the preferences of recreational boaters. Finally, the analyst will need the ability to make decisions based upon statistical data.

Appendix F contains a table in which the tasks for the three categories of personnel are outlined in the order of their occurrence.

3.2 Construction of the RBSEM Data File

The initial requirement for planning education programs for recreational boating is the development of a specialized and current data base. This data base serves as the major source of information pertaining to what type of accidents and accident causes should be addressed in the education program, how and when the education program should be conducted, and what information should be included in the program.

The construction of the specialized file of accident data is the result of a merger of supplementary coded data for RBSEM with existing raw data in U. S. Coast Guard accident files. The actual boating mishaps used for RBSEM will be a sample of accidents taken from the most recent complete year-end data, or, if necessary to achieve an adequate sample size, the two most recent complete years. At this time, it is envisioned that a file of accident records will be reconstructed at least every two years in order to assure that annual education programs being implemented are based upon current information.

The procedure for generating the information in the RBSEM file is accomplished using the three types of personnel suggested for the RBSEM data management system. The file is created in several major operations, and these operations are presented schematically in the flow diagram in Figure 3. Completion of the specialized RBSEM file of accident data will result in the production of four computer tapes: the complete file of records for the year specified, an SPSS file of accidents sampled from the complete file, an IS/ATHENA file of the same sampled accident records, and a file of verbal descriptions of the sampled accidents.

3.2.1 Selection of Accident Data for RBSEM

At this time it is anticipated that U. S. Coast Guard budgetary and man hours constraints will limit the number of accidents that can be used in the analytic phases of RBSEM. Each record used in the RBSEM system will need manual coding, and many accident records will require additional manual sorting and interpretation during subsequent phases of the analysis. Consequently, the construction of a sample of accidents is recommended. Selection of the accident data for planning an education program would ideally be based upon a one year period which immediately preceded the intended program. However, there are two problems requiring that alternative contingencies be available to the education analyst(s). First, for any give year, the actual number of various accident types available for analysis may be too small for reliable and valid analysis for a specific type of accident or for a specific accident initiator. Should this be the case, then education analysts may not feel that one complete year will supply enough information to continue the preparation of a large scale education program. It may then be desirable to extend the accident data base back into another previous year in order to ensure sufficient numbers of accidents for analysis.

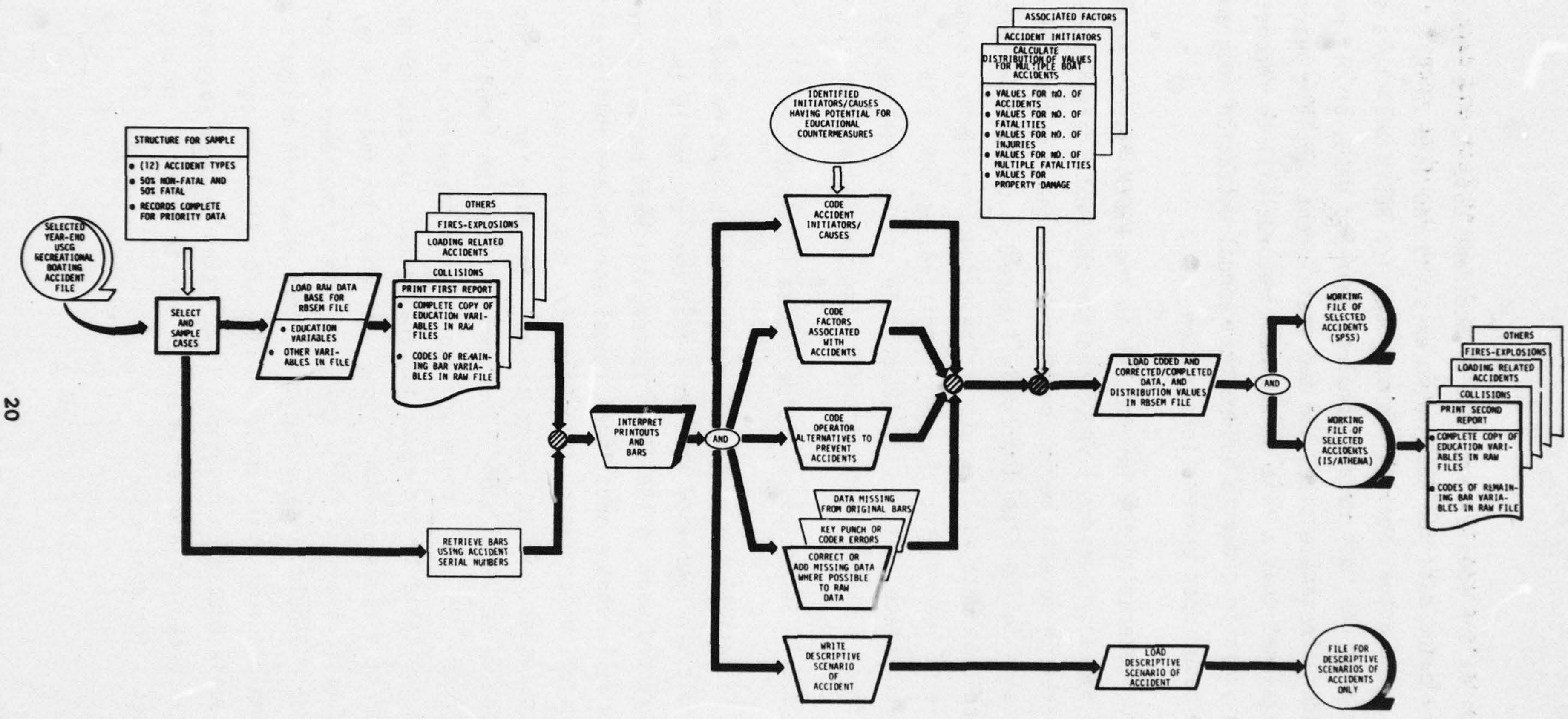


FIGURE 3. FLOW DIAGRAM OF CONSTRUCTION OF RBSEM DATA FILES

The second problem involves the use of the most recent year-end data for program planning. The major concern here is that the file should be recent and should be complete for the time interval specified. It is logical that an education program developed from complete and recent data is more likely to be timely and valid, and will therefore address the most immediate accident problem areas. At the present rate of accident reporting, etc., it is probable that the accident used for education program planning will have occurred at least one year prior to the RBSEM analysis.

Instructions for accessing the U. S. Coast Guard boating accident files are provided in the computer software documentation in Appendix G. Computer support personnel will be required to access the year-end data file, execute the sampling and retrieval programs, and load coded/corrected data for makeup of the RBSEM files (SPSS and IS/ATHENA).

3.2.2 Sampling Plan for the RBSEM File

The sampling plan used for the selection of accidents for RBSEM analysis is a combination of structured and random sampling methods. The sampling plan calls for dividing the selected group of accidents into several smaller groups, and then randomly sampling accidents from those smaller groups. The rationale for structuring the sample into groups is that accidents on which the structure is based are certain to be selected even though they occur with less frequency than other types of accidents. Three parameters of the accident data are prescribed as structure for the sample group of accidents:

<u>Parameter One - 12 Types of Boating Accidents (within four category groupings)</u>

<u>Collisions and Groundings:</u>

- groundings (boats run aground)
- collisions with other vessel
- collisions with fixed object
- collisions with floating object

<u>Loading Related Accidents:</u>

- capsizings
- flooding or swampings

- sinkings
- falls overboard

Fires/Explosions:

- fires and/or explosions of fuel on the boat
- fires and/or explosions on the boat other than fuel

Others:

- falls taken by persons within the boat
- injuries or fatalities resulting from persons being struck by a boat or by a propeller.

Parameter Two - Fatal and Nonfatal Accidents. One-half of the accidents are to be fatal accidents, and one-half are to be nonfatal. The intention of selecting large numbers of fatal accidents is to provide education analysts with as much information as possible for each accident type. It is recognized that fatal accident reports are completed more thoroughly than nonfatal accident reports.

Parameter Three - Complete and Incomplete Records. All accidents selected must meet the criterion of having the BAR sufficiently complete to include six items of information:

- age of the operator
- type of boat involved
- date of accident
- water conditions
- operation of boat at the time of accident (e.g., fishing)
- type of accident (e.g., grounding).

It is anticipated from prior experience with BAR data that these six items of information will be accompanied by other information that is more reliably reported such as "number of drownings," "number of other victims," and "number of injuries." Of course, the added constraint of accident reports being complete to include the six items of information provides a maximum possibility of "usable accident reports" for those accidents selected for the RBSEM analysis.

Overall size of the sample of accident reports for the RBSEM analysis is anticipated to be approximately 550 accidents. An interactive computer capability will

provide the education analyst with the option of varying group sizes with the various parameters in order to ensure an adequate number of accident records for the RBSEM analysis. Sample size then, is expected to vary somewhat from year to year. Size should also vary slightly from sample to sample within a given year since every multiple-boat accident record selected in a given sample will need to be accompanied by the records of all other boats involved in that accident. Table 2 includes the expected number of accidents to be utilized for each of the 12 accident types (fatal and nonfatal combined), and the corresponding number of accidents in the year-end data file (1976).

Procedures for preparing the RBSEM data files and for conducting the sampling require access to the U. S. Coast Guard SPSS accident data files. Existing U. S. Coast Guard SPSS capability is utilized in conjunction with two computer programs prepared specifically for assisting in this phase of the RBSEM data management system. The first program, PASS1, is used in the construction of the year-end accident file from the U. S. Coast Guard SPSS files. The second program, SELECT, is an interactive program used to choose the exact sample composition, and to perform the sampling procedure. Elaboration of these programs and flow charts for them are presented in Appendices H and I.

3.2.3 Weighting Procedures for Distribution of Severity Criteria for Multiple-Boat Accidents

To ensure the comparability of values for the severity criteria for multiple-boat and single-boat accidents, weighting procedures were devised. These variable weighting routines are included in the RBSEM data management computer program.

For single-boat accidents, the assignment of a cause to an accident and to any resulting fatalities, injuries, and property damage is straightforward, as only one cause is coded for the accident. In the case of multiple-boat accidents the situation is more complex. In multiple-boat accidents a cause is coded for each boat, and any fatalities, injuries or property damage which result are coded separately for each boat in the Coast Guard's Master File accident data base. For example, in a two-boat accident, the data file for each boat contains only information on the fatalities, injuries and property damage for that one boat. If the same straightforward tabulation applied to single-boat accidents were applied to

TABLE 2. VALUES FOR RBSEM SAMPLE AND YEAR-END ACCIDENT FILE (1976)

ACCIDENT TYPE	RBSEM SAMPLE YEAR-END ACCIDENTS (1976)		
	Frequency in Sample	Percent of Collision Accidents	Frequency in Year-End File (1976)
Collisions			
Groundings	18[1]	9	534
Collision with boat	130	65	3806
Collision with fixed object	34	17	966
Collision with floating object	18	9	531
Total	200[2]	100%	5837
Loading Related Accidents		Percent of Loading Related Accidents	
Capsizings	84	42	753
Swampings/Floodings	40	20	349
Sinkings	34	17	312
Falls Overboard	42	21	377
Total	200[3]	100%	1791
Fires and/or Explosions		Percent of Fires/Explosions	
of Fuel	86	86	500
Other Than Fuel	14	14	80
Total	100[4]	100%	580
Others		Percent of Others	
Persons Fall within Boat	12	26	47
Persons Hit by Boat or Prop	38	74	133
Total	50[5]	100%	180

NOTES:

1 Actual sampled frequencies will vary as the sampling plan rounds values up to tne nearest even number, thus providing the same number fatal and nonfatal accidents.

2 200 accidents are 3% of the collision accidents occurring in 1976.

3 200 accidents are 11% of the loading related accidents occurring in 1976.

4 100 accidents are 17% of the fires and explosions accidents occurring in 1976.

5 50 accidents are 28% of the combined "...falls within the boat" and the "...hit by boat or prop" in 1976.

the multiple-boat accidents, the coded "fatalities" by "cause" on a boat-by-boat basis would indicate some misleading conclusions. For instance, consider a two-boat collision in which a large boat collides with a much smaller one resulting in the deaths of four boaters on the smaller boat. The simple tabulation of the coded fatalities would lead to no fatalities being attributed to the cause identified for the larger boat and four fatalities being attributed to the cause identified for the smaller boat. It is probable that the fatalities here should show up on the tabulations for both accident causes.

To rectify tabulations for multiple-boat accident causes without double counting the fatalities, injuries or property damage, the RBSEM accident file has been augmented with a group of additional variables. These variables are intended to evenly distribute the fatalities for all causes established for the accident. The variable "WEIFAT," meaning weighted fatalities, has been designated to divide the number of fatalities in an accident by the number of boats in the accident. For single-boat accidents, the value of the variable "WEIFAT" corresponds to the number of fatalities which occurred in the accident and, therefore, has the same value as the variable "FATALS." In the case of a two-boat accident, the value of the variable "WEIFAT" is one-half the total number of fatalities in the accident. As this value is obtained from the fatality data for both boats it will be at least as large as the smaller of the "FATALS" variable values for the two boats and no larger than the larger of these two values.

This tabulation of fatalities (using the "WEIFAT" variable) counts each fatality only once, and for multiple-boat accidents, arbitrarily associates an equal fraction of the total accident fatalities with each boat's cause. Thus, for a two-boat accident with three fatalities, $3 \div 2$ fatalities are associated with each boat. If the coded accident causes for the two boats were, say, code 221 and code 112, then $3 \div 2$ fatalities would be associated with cause 221 and $3 \div 2$ fatalities would be associated with cause 112. If, on the other hand, cause code 221 was coded for both boats, then $(3 \div 2)+(3 \div 2)=3$ fatalities would be associated with this cause.

The variable "WEIFAT" may be used to rank causes according to the number of fatalities with which they are associated. This is accomplished by tabulating the variable "WEIFAT" for each cause. The SPSS statistical procedure which accomplishes this is the "Breakdown" procedure. The actual SPSS command is:

BREAKDOWN TABLES = WEIFAT BY CAUSE.

This command will initiate a tabulation of the total fatalities associated with each cause.

Injuries and property damage also require the creation of new variables. That is, the RBSEM Accident File will contain the variables "WEINJ" and "WEIPRO" which equally distribute the total injuries and property damage in an accident among all of the boats in the accident. As with "WEIFAT" these variables are coded for each boat. The defining equations are:

$$\text{WEINJ} = \frac{\text{total number of injuries in accident}}{\text{number of vessels involved*}}$$

$$\text{WEIPRO} = \frac{\text{total amount of property damage in accident}}{\text{number of vessels involved}}$$

These definitions are exact analogues of the definition of "WEIFAT:"

$$\text{WEIFAT} = \frac{\text{total number of fatalities in accident}}{\text{number of vessels involved}}$$

By use of the three weighted variables, accident causes may be rated according to the severity criteria (fatalities, injuries, and property damage) in a way that weights each cause in the accident without double counting or omitting any cause.

In order to calculate tabulations for the remaining severity criteria in the multiple-boat situation, i.e., number of accidents, number of fatal accidents, and number of multiple-fatality accidents, a similar weighting procedure was developed. Two additional variables were created, one of which, "FRACACC," is already available in the Master File data base, and is defined by the equation:

$$\text{FRACACC} = \frac{1}{\text{number of vessels involved}} = \frac{1}{\text{NUMBVES}}$$

*The "number of vessels involved" is coded in the Master File and RBSEM Accident File as the variable "NUMBVES."

The second variable, "SUMFAT," is defined as the total number of fatalities in an accident. Thus, in coding a two-boat accident involving three fatalities, each boat has the value "1/2" coded for the variable "FRACACC" and the value "3" coded for the variable "SUMFAT." The reader may wish to note that

$$\text{WEIFAT} = (\text{SUMFAT}) \cdot (\text{FRACACC}).$$

The variables "FRACACC" and "SUMFAT" enable the tabulation of the remaining severity criteria by coded cause without double counting of any accidents. The number of accidents associated with each cause may be tabulated by using the following SPSS command:

```
BREAKDOWN                TABLES = FRACACC BY CAUSE
```

If tabulation of fatal accidents by cause is desired, the following two SPSS commands are appropriate:

```
SELECT IF                SUMFAT GT 0
BREAKDOWN                TABLES = FRACACC BY CAUSE*
```

If one desires a count of the number of multiple-fatality accidents, the appropriate commands are:

```
SELECT IF                SUMFAT GT 1
BREAKDOWN                TABLES = FRACACC BY CAUSE
```

By tabulating accidents, fatalities and other severity criteria of cause, one may then proceed to rank coded causes according to these criteria. In a similar manner, the associated factors may be ranked by tabulating the various severity criteria by each coded associated factor. It should be noted that, for multiple-boat accidents, associated factors are treated in the same manner as are causes. For instance, in the case of a two-boat accident, if only one of the two boat operators involved is coded as being fatigued, then only one-half of that accident is attributed to this factor.

*The variable "WEIFAT" could be used in place of "SUMFAT" here, but not in the following case of multiple-fatality accidents.

To tabulate associated factors by the severity criteria, note that each associated factor is coded with its assigned non-zero variable number if it is present and blanks if it is absent or if its status is unknown. The coding scheme used is as follows:

01	operator alcohol consumption
02	operator fatigue
03	glare
04	excessive shock/vibration, noise
05	operator inattention
06	excessive speed
07	reckless or malicious operation
99	other
b̸b̸	none or unknown

It is therefore necessary to perform a separate "breakdown" procedure for each associated factor variable. For instance, to determine the number of fatal accidents involving the associated factor "FATIGUE" the SPSS commands would be:

```
SELECT IF                 SUMFAT GT 0
BREAKDOWN                 TABLES  =  FRACACC BY FATIGUE
```

The sum value for "FRACACC" corresponding to the value "02" of the variable "FATIGUE" represents the weighted number of fatal accidents for which evidence of operator fatigue was present. A similar procedure involving the SELECT IF and BREAKDOWN commands is used to tabulate the incidence of occurrence of the other associated factors; according to the other severity criteria (e.g., WEINJ, WEIPRO).

3.2.4 Preparation of Selected Accident Records for Coding Operation

The manual coding operation is a routine analysis of each selected accident from the sampling procedure. The outcome of the analysis will provide information to augment the BAR data already contained in the RBSEM data files for each accident record. This section describes the preparation of the existing raw accident data for presentation to coders. With the exception of the written description of each accident provided on the BAR, all information necessary for the coding task is (or should be) available in the existing data files of the selected accidents. The

written description will need to be presented to coders on copies of the original BARs, MIOs, etc. Of course, the coding instructions for the original encoding operation from the BARs will also need to accompany the package of coding materials for RBSEM coders.

The presentation format for the accident information was designed to facilitate accuracy and speed of the manual coding operations. The information available in the data file for each sampled accident record is displayed on a single 11" x 15" computer page. Figure 4 shows the format of this page. The variables chosen for inclusion in the computer report were classified into two groups, according to how relevant they are likely to be for RBSEM purposes. Those judged most important are referred to as "education variables" in this report. The information pertaining to them appears first on the page and is not in coded form, i.e., values given are verbal or real numerical values. Those deemed of secondary importance, labeled in the report as "additional accident information," follow the first group, and the values are given in coded form, using the Coast Guard master file coding system.

3.2.5 Coding Procedures for Accidents to Augment Raw Data Files

The RBSEM coders are asked to perform five basic operations using the computer reports for the sample accident file, and the corresponding BARs and related information (e.g., MIO report). They begin by reviewing the computer report for accuracy and completeness. If additional important information can be gleaned from the BAR and other materials which has not been coded, this should be added to the printout.

Coding operation two is to identify the initiator for the accident using all available information (including additional information discovered in operation one, above). This step requires the use of the cause analysis instrumentation which corresponds to that particular accident type.

In coding operation three, the presence of various factors associated with the occurrence of the accident is identified, using the list of associated factors which has been compiled in the process of previous accident analyses.

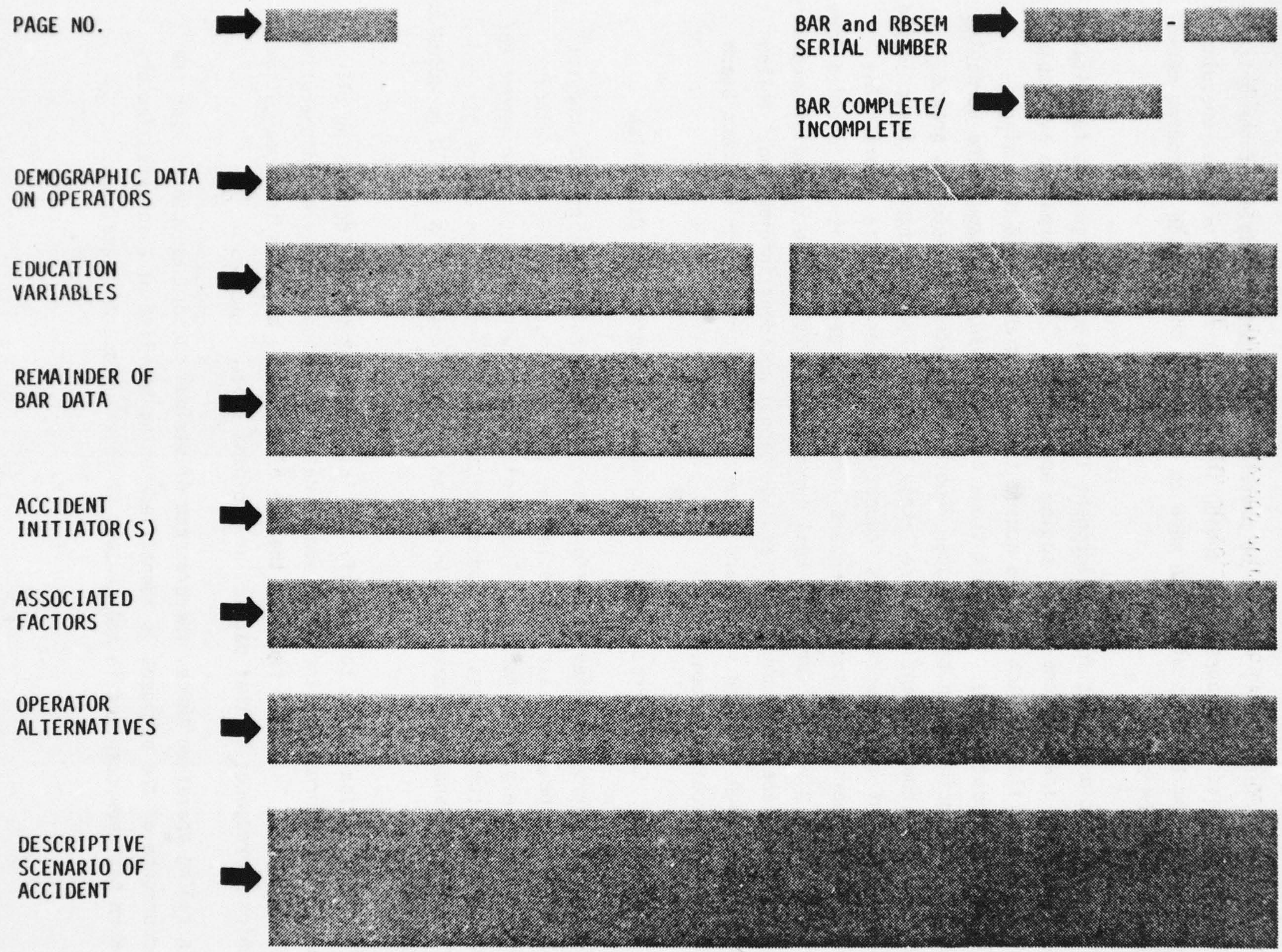


FIGURE 4. FORMAT FOR COMPUTER PRINTOUT OF RAW DATA FILES FOR U.S. COAST GUARD CODER USE IN RBSEM

Coding operation four is to determine operator alternatives for avoiding the accident, and for preventing injuries or fatalities. This procedure varies somewhat from the identification of operator alternatives in the previous collision and loading related accident education projects. In the earlier work, coders were asked to write out the involved boat operator's behavioral and decision alternatives to prevent the accident/fatality. This proved somewhat time-consuming since each coder was dependent upon his own resources to phrase the alternatives on a work sheet as he saw them. The revised procedure for the RBSEM system provides a comprehensive list of operator alternatives already compiled for each accident type, from which the coder selects appropriate ones. In the event that no acceptable operator alternative is available on the list, the coder can write in his choice on the coding sheet.

The source for the list of operator alternatives for RBSEM was from the same group of accidents used to construct or revise the cause analysis instrumentation for each corresponding group of accidents. In the collision and loading related accidents, three experienced accident investigators were asked only to review the BARs used for construction of the original cause analysis instrumentation and to determine the alternatives. It should be noted that this procedure was done in the earlier education projects. However, the loading related accidents caused by the "sudden maneuver" initiator were omitted from this original effort.* The operator alternatives for the remaining types of boating accidents were prepared while the respective cause instrumentation was being developed. Care was taken to edit each alternative after the comprehensive list was prepared. This ensured parallel structure wherever possible, and provided the most economical phrasing. The summed total number of operator alternatives generated for each accident type is listed in Table 3. The comprehensive list of alternatives for each accident type is given in Appendix D.

The fifth operation required of coding personnel is to write out a brief description of the accident within the space of 600 characters (alphanumeric characters and spaces). The information to be included in the description is a *scenario* of the accident which consists of a summary of salient events and the sequence of

---

* In the earlier projects, the investigators were asked to review only those accidents being selected for the prototype education program. "Sudden man euvers" initiated accidents were excluded on the basis of their relatively low frequency of occurrence in the loading related data base. In the current project, operator alternatives were generated for the sudden maneuvers acci dents during the revisions of the loading related cause analysis instrumentation.

TABLE 3. TOTAL NUMBERS OF OPERATOR ALTERNATIVES FOR EACH ACCIDENT TYPE

ACCIDENT TYPE	ACCIDENT AVOIDANCE[1] (FREQUENCY)	INJURY/FATALITY REDUCTION[2] (FREQUENCY)
Collisions (groundings, collisions w/other vessel, collisions w/fixed object, and collisions w/floating object combined)	22	2
Loading Related Accidents:		
Capsizings		
Initiated by load shifts	13	5
Initiated by waves	13	3
Initiated by wakes	5	3
Initiated by sudden maneuver	11	3
Swampings/Floodings and Sinkings		
Initiated by load shifts	10	3
Initiated by waves	22	3
Initiated by wakes	9	3
Initiated by sudden maneuvers	15	4
Falls Overboard		
Initiated by load shifts	12	2
Initiated by waves	3	2
Initiated by wakes	5	2
Initiated by sudden maneuvers	7	3
Fires/Explosions of Fuel	13	0
Fires/Explosions Other than Fuel	7	0
Falls within Boat	17	1
Hit by Boat or Propeller	11	0

1 These alternatives include behaviors which could have served to prevent the accident altogether; or to contain the accident once it has begun, to mitigate the seriousness of it.

2 These alternatives include behaviors which serve to reduce the likelihood of injuries or fatalities for victims as a consequence of the accident.

their occurrence. Emphasis will be on specifying the major facts that contributed to the accident and/or made the accident unavoidable.

A detailed account of these tasks can be found in Appendix J, which is a complete set of instructions designed for use by the coder.

3.2.6 Merger of Selected Accident Raw File Information and Coded Information

The raw data base generated from the sample of BARs on the year-end tape must be combined or merged with the coded and corrected information. This is accomplished using CDC prepared computer software. The combined output of this phase of the RBSEM project after merging original and new data will be three separate tapes and files of boat accident information:

- a working file of all selected accidents with raw and coded data in the IS/ATHENA data management package
- a working file of the same accidents with raw and coded data in the SPSS statistical package
- a working file of the descriptive 600 character-space scenarios of the accidents.

Subsequent determination of guidelines for educational message construction, media selection, and message timing, as well as specification of educational objectives will be made from the combined use of the three files.

3.3 Identification of Accident Types, Accident Initiators and Associated Factors for Educational Countermeasures

The selection of education programs is dependent upon the establishment of priorities for various types of accidents, initiators, and factors associated with the occurrence of the accidents. This process of *prioritization* involves an analytic procedure that will systematically identify those accident types, accident initiators, and associated factors where severity is relatively great, and consequently, where intervention utilizing educational countermeasures appears warranted. The flow of information and decisions for this phase of the RBSEM data management system is presented in the flow diagram in Figure 5.

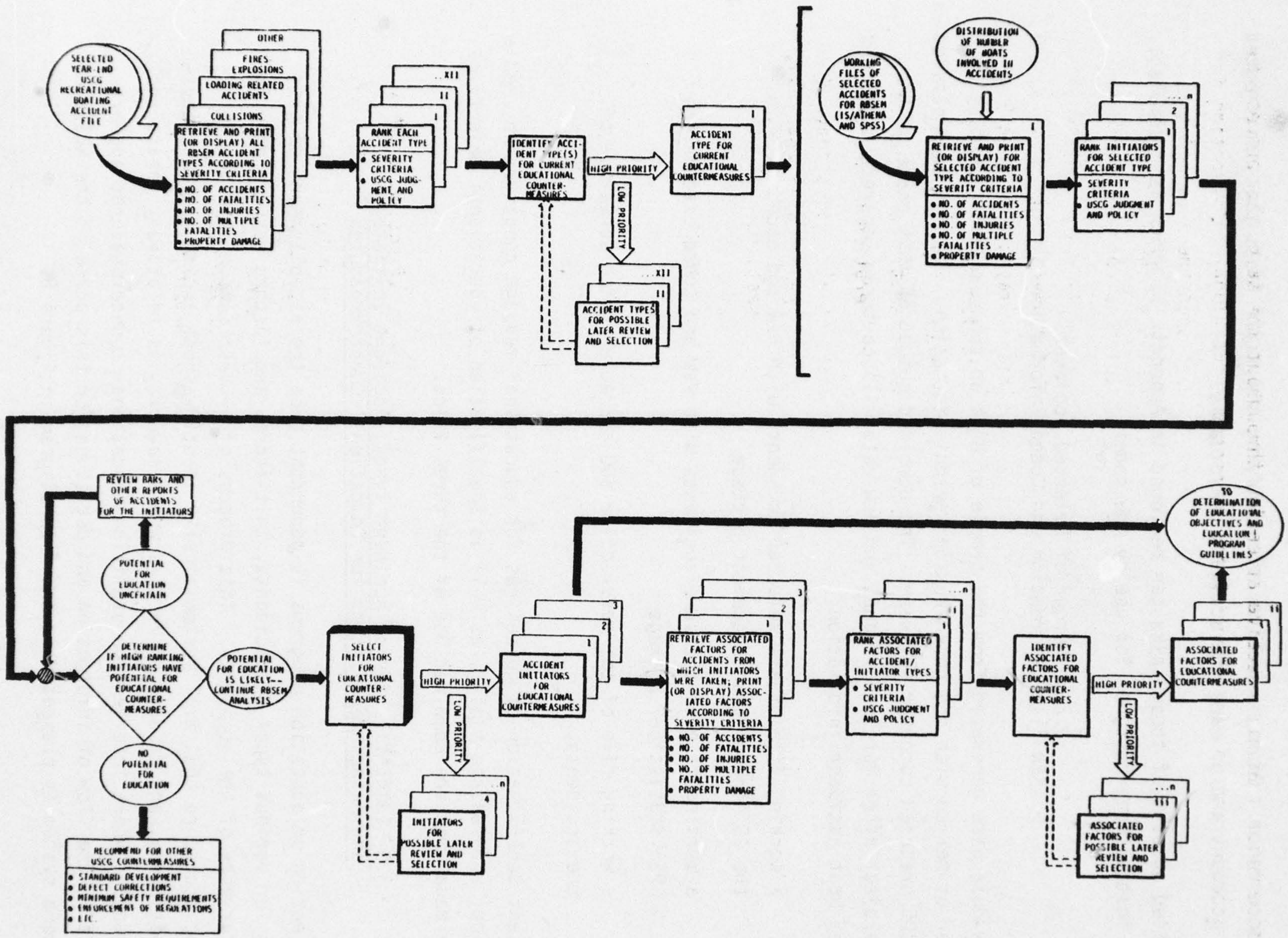


FIGURE 5. FLOW DIAGRAM OF IDENTIFICATION OF ACCIDENT TYPES, ACCIDENT INITIATORS, AND ASSOCIATED FACTORS FOR EDUCATION PROGRAMS

One consideration that must receive attention throughout the selection process for an education program is the potential for successful educational intervention for any selected accident type. This potential is dependent upon the feasibility of actually modifying boaters' behavior in ways that reduce the likelihood of the occurrence of an accident. It should be noted that decisions concerning the potential for education are quite different from decisions based upon accident severity. Consider that in some cases, a given group of accidents will have a frequently occurring accident initiator, but that initiator may not be amenable to education. In other instances, boaters' alternative behavior may offer potential for reduction of an accident type, but there is a low probability of actually gaining compliance for that alternative behavior. The systematic selection of an education program should be based upon the collective consideration of accident severity and the likelihood of the more severe accidents actually being reduced in frequency of occurrence by utilizing educational countermeasures. This consideration is discussed more thoroughly at a later point in this section.

The severity of any given accident type or accident initiator is to be assessed using five severity criteria. These criteria are:

- frequency of accident occurrence
- frequency of fatalities
- frequency of reported injuries
- frequency of multiple-fatality accidents
- amount of reported property damage.

These severity criteria will be used to rank order the types of accidents, the accident initiators, and the associated factors for possible selection for education programs. It is likely that the education analyst may wish to exercise considerable judgment concerning the interpretation of the rankings. This judgment will be particularly important where a particular accident type or accident initiator has an inconsistent ranking on two or more of the severity criteria. For example, capsizings may occur less frequently than groundings, but they may be responsible for a higher frequency of fatalities.

Calculation of values for each severity criterion is accomplished using the existing SPSS statistical computer package. In effect, the actual comparisons of accident types, accident initiators, and associated factors result in three conceptual matrices. One axis of each matrix corresponds to the five severity criteria, and the other axis refers to the 12 accident types, the accident initiators, or the associated factors occurring in the accidents. Of course, the operational arrangement of accident initiators for coding is displayed in "trees" in the conventional cause analysis format.

The analytic procedures for identification of high priority accident types, accident initiators, and associated factors are presented in the following sections in a stepwise format. All computer software required for the analysis is currently available in the SPSS statistical package. The education analyst and computer support personnel will be required to coordinate their efforts closely throughout the conduct of this analysis.

3.3.1 Step One: Determination of High Priority Types of Accidents

The determination of high priority types of accidents is based upon analysis of records in the *complete* year-end boating accident file. This is the same file from which the sample of accidents was taken for the construction of the RBSEM working files. The information produced in this step will very likely parallel the data available in the CG-357 publication for the year under consideration. In fact, it is possible that use of the CG-357 publication may be all that is required to select the type of accident for education analysis if the few "straggler" BARs for that year, that normally appear after publication deadlines, can be ignored. The working files of RBSEM accidents would not need to be consulted for this analysis since the selection of accident type can be made efficiently from the uncoded data. Of course, the use of a complete data file will eliminate the possible influence of sampling error during the ranking of accident types on the severity criteria.

The SPSS statistical package is recommended to retrieve, calculate, and print out (display) the information required for this stage of the analysis. The output of the SPSS package should be the computation of the five severity criteria values for each of the 12 accident types. The education analyst will then review this

data and rank each accident type according to the objective values given for severity, and according to U.S. Coast Guard policy, judgment of priorities, and preferences for the education program to be developed through the current effort. Ideally, one type of accident (possibly two) should be selected for attention in the education program under development for any given year.

3.3.2 Step Two: Determination of Priority Ranks for Accident Initiators Within the Selected Accident Type

The identification of accident initiators requires use of the working RBSEM files of accidents. Again, the five severity criteria are used for prioritization of the accidents initiators (within the selected accident type). Accessing the RBSEM working file is done using the SPSS statistical package, and severity criteria values are calculated for each initiator using the appropriate SPSS commands. These calculated values will require judgment and interpretation by the education analyst in order to rank the initiators for importance in the education program under development. The outcome of this step should be a reliable rank ordering of all accident initiators that have high severity criteria values associated with them.

Two characteristics of the RBSEM data base complicate the ranking procedure of accident initiators, and will require special attention on the part of the education analysts. First, the multiple-boat accidents within any selected accident type need to be combined on an equitable basis with the single-boat accidents of the selected type. This necessitates referring to the weighted values described earlier in Section 3.2.3 for distributing severity values across all boats involved in a multiple-boat accident. Since the weighted values will often be fractions or decimal numbers, they will pose some interpretation questions. For example, a single fatality resulting from a two-boat accident attributes the value of 0.5 for fatalities for each of the two initiators involved (or one-half of a fatality). This procedure actually should not present a real problem since the fractionalized numbers are, by definition, considered as weighted values. Any fractional values for fatalities, accidents, etc. may be interpreted the same way as "averages" of whole numbers.

The second problem of the RBSEM data base that complicates the ranking of the initiators is that the severity criteria values will vary according to the depth of analysis into the cause analysis tree (or the specificity of the cause), as well as varying independently on an accident by accident basis. That is, as one moves from severity values entered for more general initiators at the top of the tree down to the more specific initiators near the base, there are fewer opportunities for accidents to occur in any one specific initiator category. This means that an ideal and completely fair ranking of initiators must be accomplished at identical levels of the tree for a complete and thorough comparability. It should be acknowledged that a completely unbiased comparability is impossible owing to the absence of uniformity of initiators by levels in the tree. Consider that some typical logic chains in a given tree may extend to three or four levels, and any of these may have multiple branches of initiators.

Obviously, the solution to interpretation of the severity values for the initiators is to resort to manually collapsing some of the logic chains until an intuitive sense of fair comparison between initiators is possible. This recommended procedure was used in the previous collision and loading related accident education projects, and was found reasonably acceptable by Wyle principals involved with planning the prototype education programs. Since no statistical testing is necessary for this analysis, these procedures need not meet the rigorous constraints of significance tests. However, the analyst will need to ensure that subsequent combinations of initiators are warranted by a replicable logic. In addition, a specific accident in a chain of initiators must be tabulated once only for any comparisons between initiators.

There are no absolutes regarding this kind of procedure, but analysts should ensure that areas of high severity concentration are addressed, so that educational efforts are likely to result in a reasonable decrease in accidents of the general type under consideration.

3.3.3 Step Three: Determination of Potential for Educational Intervention of Higher Ranking Initiators

After the education analyst has ranked the various initiators or groups of initiators according to severity values and judgmental considerations, the relative potential for operator educatability for each will need to be confirmed. Guide-

lines for this have been built into the data management system to assist analysts with this determination. During the cause identification instrumentation phase of the RBSEM project, each initiator for all the accident types was marked or "flagged" to indicate one of three possible interpretations:

<u>Interpretation One</u>: The initiator has educational potential since a modification of boater behavior relative to the initiator would have prevented the accident, or would have prevented injuries and fatalities.

<u>Interpretation Two</u>: The initiator has no educational potential since any reasonable modification to boater behavior would not have prevented the accident, or would not have prevented injuries and fatalities. Also considered in the category are initiators involving boater behavior identified as unchangeable. Accidents occurring in this category may be referred for intervention to other countermeasures such as standards development, defect correction, minimum safety requirements, or enforcement of regulations.

<u>Interpretation Three</u>: It is unknown without a review of all available information on the accident record whether a modification of boater behavior would have altered the outcome of the accident situation. It is considered essential that the interpretation for this initiator be made by education analysts, rather than by the boat accident coders during the construction of the RBSEM working file. Education analysts will be required to read the complete computer page record of the accident and the original BAR, etc., in order to determine whether or not this individual accident has potential for educational intervention.

The specific initiators are listed in Appendix O by their code numbers, along with their respective potential for education.

3.3.4 Step Four: Selection of Accident Initiators for Educational Countermeasures

The selection of accident initiators for subsequent education program development is made from the high ranking accident initiators categorized (initially or after review) as having educational potential. Those initiators or groups of initiators having the highest severity criteria values should be among the initiators selected.

There is no fixed upper or lower limit for the number of initiators to be selected. However, as a guide, the education analyst may wish to consider that, "in his opinion," the initiators selected would be sufficient in number, or in concentration of severity criteria values, that the corresponding accident type would be notably reduced (assuming successful intervention occurred and boater behavior was modified). At this time, it is expected that between one and four initiators are likely to be produced for educational countermeasures for any single accident type.

3.3.5 Step Five: Identification of Associated Factors for Accidents Producing Selected Initiators

There are two possibilities for the RBSEM analysis relating to the associated factors. The education analyst may choose to deal only with those accidents involving the accident initiators selected in the previous step. Certainly, the consideration of these factors will provide the opportunity for the most comprehensive understanding of the accident type under consideration. If this route is chosen, the associated factors found to be present within the chosen accident initiators should be rank ordered according to the severity criteria.

The alternative analysis of associated factors is to deal with them at the same level of analysis as the accident initiators. The education analyst may wish to rank the associated factors for the selected accident type independently of the initiators. Then he may select associated factors for a separate education program based upon greater severity criteria values and/or according to U.S. Coast Guard policy and judgment (as with the initiators). Again, there are no fixed upper or lower limits for the number of associated factors that will produce an optimal program. Conservatism may be an appropriate guide word here since educa-

tional countermeasures directed to associated factors may not produce notable reductions in the related accidents. Recall that by definition, the associated factors were not linked to the accidents at a *cause and effect* level. Rather, they were simply present at the time of the accident "in the judgment of" the accident coder or person completing the BAR. Overall, there is considerable flexibility for the treatment of associated factors for education programs.

The outcome of the five steps listed should be the selection of one (or perhaps two) accident types that justify educational countermeasures primarily on the basis of accident severity criteria. In addition, these steps will produce a prioritized group of accident initiators according to the severity criteria and accompanying information from the respective accidents, and a prioritized list of associated factors. The associated factors are prioritized by their occurrence within the selected accident initiators, or by an independent rank ordering.

3.4 Specification of Educational Objectives for Education Programs

The implementation of an education program is guided by two major types of information: the educational objectives for the program, and corollary information for adapting the programs for maximum effectiveness. Of course, educational objectives are the stated intentions of the education program, and they directly determine program content and methods. Corollary information consists of facts reported about the boats involved, weather and water conditions, etc. This information is used to influence the programs in the form of guidelines. These guidelines are instrumental in planning educational messages, selecting media and methods for communication of the messages, and for decisions regarding the technical aspects of message production. This section will deal with the procedures for determining education objectives for the RBSEM system. A subsequent section will present procedures for dealing with the information to serve as guidelines for program development. Both procedures are presented in the flow diagram in Figure 6.

Education objectives are to be specified for accidents caused by the selected accident initiators, and the selected associated factors. The procedures for specifying the education objectives for the accident initiators require a three

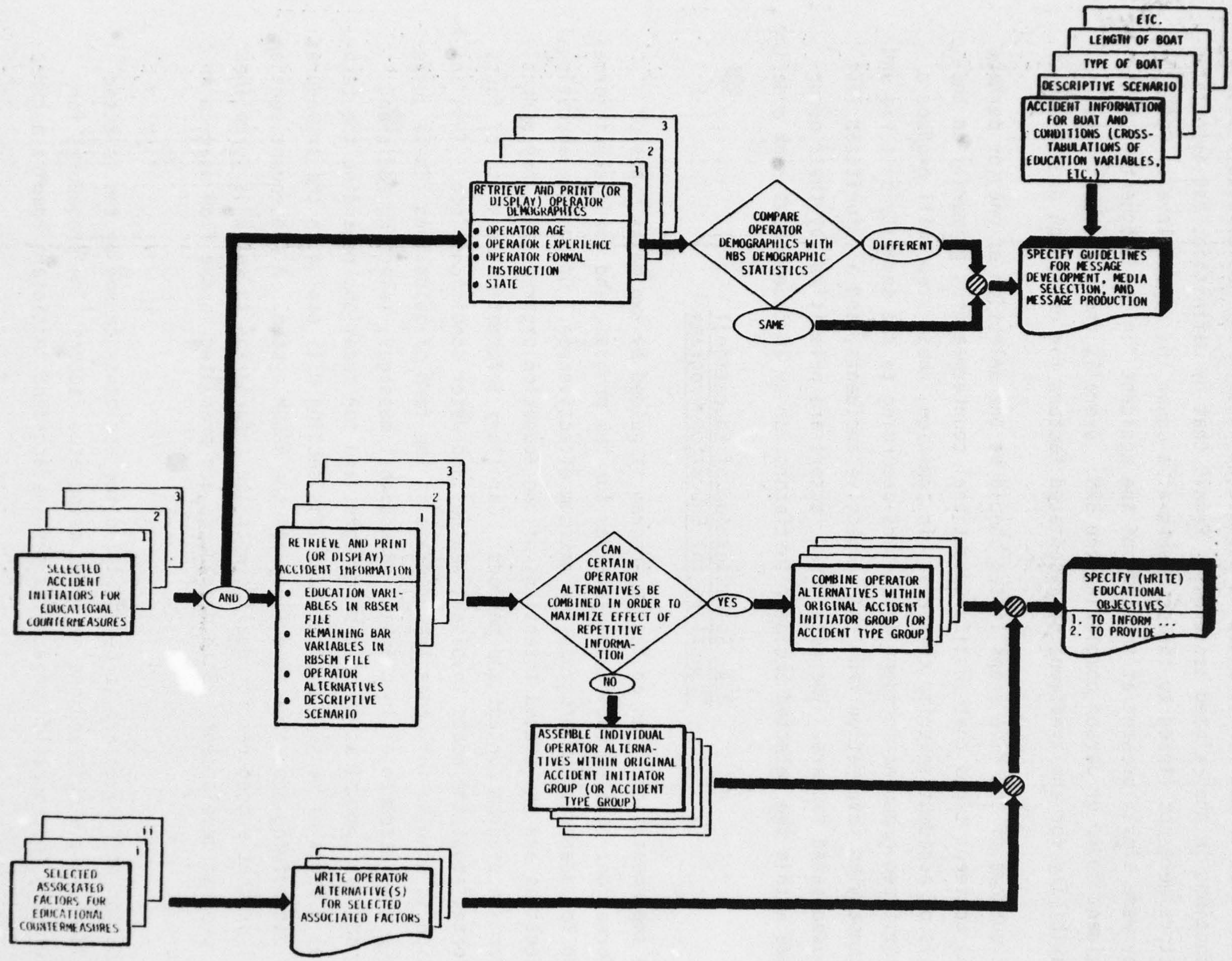


FIGURE 6. FLOW DIAGRAM OF SPECIFICATION OF EDUCATION OBJECTIVES AND GUIDELINES FOR EDUCATION PROGRAMS

step effort. First, computer support personnel are requested to retrieve the complete RBSEM record of BAR and coded information for each accident in the selected initiator groups. The format for displaying the information is identical to the layout of information used by the accident coders in construction of the RBSEM working files. However, all items of information produced by the coders from their analysis of each accident record, and the BAR information are now included in the RBSEM record. Each computer page for a given accident will contain the operator alternatives for avoiding the accident (and for reducing fatalities), the 600 character descriptive scenario of the accident, the education variables previously included on the computer pages for coders (although the data may be corrected or in more complete form), and the remaining BAR variables given in the year-end file.

Secondly, the education analyst manually sorts the operator alternatives for the selected accidents into groups of similar or highly related operator behaviors.* In some instances, this grouping of alternatives will involve identifying identical alternatives (e.g., "wear PFD if nonswimmer, young child, or elderly"). In other instances where grouping is possible for different alternatives, there will be similarities such as "quarter the bow of the boat into oncoming wake," and "quarter the bow of the boat into oncoming wave(s)." The determining guidelines for whether or not to combine alternatives, and how to combine the alternatives will most likely result from the number of alternatives generated for the selected accident group, and the intuitive "feel" the education analyst has for the scope and sophistication of the education program under development. Analysts should take care to keep the operator alternatives identified within the selected accident initiator group and selected accident type group, thereby ensuring the availability of justification for cost and benefits for a given education program (since operator alternatives are the principal data for defining educational objectives).

---

* It may be desirable to utilize the SPSS computer capability for pointing out operator alternatives independently of the RBSEM computer page. This alternative may be accomplished using the appropriate SPSS commands, and can be done in such a way that the alternatives remain identified with their respective initiators and accident type.

The actual writing of educational objectives is the third task for the education analysts. This procedure is literally a rephrasing of the operator alternatives from the check list coding form, to a form consistent with the infinitive phrase format characteristic of behavioral objectives. The phrasing for each educational objective should include an identification of the persons to be educated, and the desired behavioral outcome of the educational effort.

Consider the following example. An objective specified for the previous loading related education program was, "To maximize boaters' alertness to exceptional wave and wake conditions relative to the freeboard and stability of their boat." A combination of four different operator alternatives was used to prepare this objective:

- *"know the operating limits of the boat and avoid water conditions that exceed those limits,"*
- *"be familiar with area of boating activity,"*
- *"be aware of small craft advisories and heed them,"*
- *"remain alert for identifying early signs of adverse water or weather conditions."*

The number of educational objectives produced for each accident initiator will vary as a function of the complexity of the initiator itself, and will also vary as a function of the level of abstraction/specificity at which the objectives are written. Obviously, the more abstract the objectives, the fewer the number of objectives that will be required to cover a given group of operator alternatives.

The procedures for preparing educational objectives for the selected associated factors are considerably less complex. The associated factor and the desired boater behavior are specified in phrasing suitable for educational objective form. Again, this form utilizes the infinitive phrase format, and includes information about who is to be educated, and what is the desired behavioral outcome of the education. An objective used in the previous collision education research for the

combination of alcohol, fatigue, and stressors factors was "To call boaters' attention to the fact that there are several factors aside from actual causes of accidents that can contribute to the occurrence of an accident, and that also can increase the severity of injury, and likelihood of fatalities." It should be noted, however, that a more specific educational objective may be of greater use to message production personnel; and, therefore, it may be more instructive to phrase one objective for each selected associated factor. In this way, production personnel have a more tangible referent for designing and producing educational materials.

3.5 Specification of Guidelines for Message Development, Method and Media Selection, and Message Production

Options for generating the corollary data for guidelines in later stages of the development of education programs should remain as flexible as possible. Two general kinds of information will be used to develop these guidelines for the education programs: information about the boat operator, and information about any and all other salient conditions reported for the accidents (i.e., the education variables).

One question the education analysts are very likely to be interested in is the determination of whether the boat operators involved in accidents are different from the general population of boaters as reported in the Nationwide Boating Survey (NBS). The demographic characteristics available in the RBSEM data base, for consideration are:

- operator age
- operator experience
- operator's formal instruction in boating courses.

The basic procedure for accomplishing the comparison between boat operators was established in the earlier loading related and collision education projects. The three demographic variables will need to be retrieved from the RBSEM working data files for the accidents in the selected initiator group. Then the tabulated values associated with each variable will be compared with NBS statistics. The SPSS statistical package can be utilized for this comparison, or the comparison can be made manually as was done in the earlier projects. If sufficient numbers

of accidents for the selected initiator groups are available, nonparametric statistical testing may be desirable to substantiate the outcome. At this time, it is anticipated that the chi-square "goodness of fit" test will be suitable for comparison purposes. If no differences are determined, then education analysts may be justified in utilizing commercially available demographic specifications of boaters, such as subscription lists for boating magazines. Regardless of the outcome of the comparison, the results for operator characteristics will need to be made available for subsequent educational method selection, and media/production development. Appendix P contains a section reproduced from Reference 2, where this procedure is illustrated.

There are several additional exploratory comparisons among education variables that may be desirable, and in some instances, essential for program planning. All variables of interest can be tabulated in single arrays or can be crosstabulated using the SPSS statistical package. Specification for any of these comparisons will normally be generated by the need to better understand the interaction of one variable with another, or to determine severity criteria for any given variable. It is likely that message production personnel may request specific comparisons in order that they may bear more directly on important points in the boating accident situation. At the very least, the information generated in these exploratory analyses will add to production personnel's awareness and sensitivity to the unique demands of educating the recreational boating public. The SPSS statistical package will require no new or revised procedures for these comparisons, and they can be undertaken at minimal cost and effort on the part of the education analyst.

The procedures specified for the RBSEM data management system are intended to provide the U.S. Coast Guard with a systematic, flexible planning tool for development of education programs. The alternative operations and decisions recommended should not require expertise beyond that which is already available in the U.S. Coast Guard Boating Safety Policy, Planning, and Information Analysis Staff and the Education Branch.

REFERENCES

1. Sager, E., K. Geissler, B. Hayes, and J. Berman, Educational Alternatives for Boating Safety Programs, Wyle Laboratories Final Report, May, 1978.

2. Sager, E., S. Cohen, and K. Geissler, Pleasure Boat Collision Education, Wyle Laboratories Final Report, May, 1978.

3. Sager, E., K. Geissler, and S. Cohen, Pleasure Boat Loading Related Accident Education, Wyle Laboratories Final Report, May, 1978.

4. Delong, T.W., A Fault Tree Manual, December, 1970. NTIS No. AD 739 001.

5. Cohen, S., R. Giuntini, and C. Stiehl, Regulatory Effectiveness Methodology: Phase II-Research, pp 2-14. Wyle Laboratories Interim Report, April, 1977.

6. MacNeill, R., C. Stiehl, S. Cohen, and T. Doll, Recreational Boat Safety Collision Research-Phase II, Vol. I, Problems Definition, Safety Enhancement Concepts, Wyle Laboratories Final Report, May, 1976. NTIS No. AD A036 577.

7. Lancaster, G., C. Stiehl, T. Doll, and R. MacNeill, Recreational Boat Safe Loading - Operator Study, Wyle Laboratories Final Report, June, 1976. NTIS No. AD A039 889.

8. Doll, T., M. Pfauth, J. Gleason, S. Cohen, C. Stiehl, R. Giuntini, and B. Hayes, Personal Flotation Devices Research - Phase II, Wyle Laboratories Final Report, January, 1978.

9. White, R., C. Stiehl, and N. Whatley, A Study to Determine the Need for a Standard Limiting the Horsepower of Recreational Boats, Wyle Laboratories Final Report, April, 1978.

10. Ford, A.B., and R.E. Beck, An In-depth Study of Recreational Boat Fires and Explosions, USCG Office of Research and Development, 1970, NTIS No. AD 717 955.

11. Loeser, R., Boating Accident Investigations 1973, Fire and Explosions 1974, Underwriters' Laboratories Final Report, NTIS No. AD A014 099.

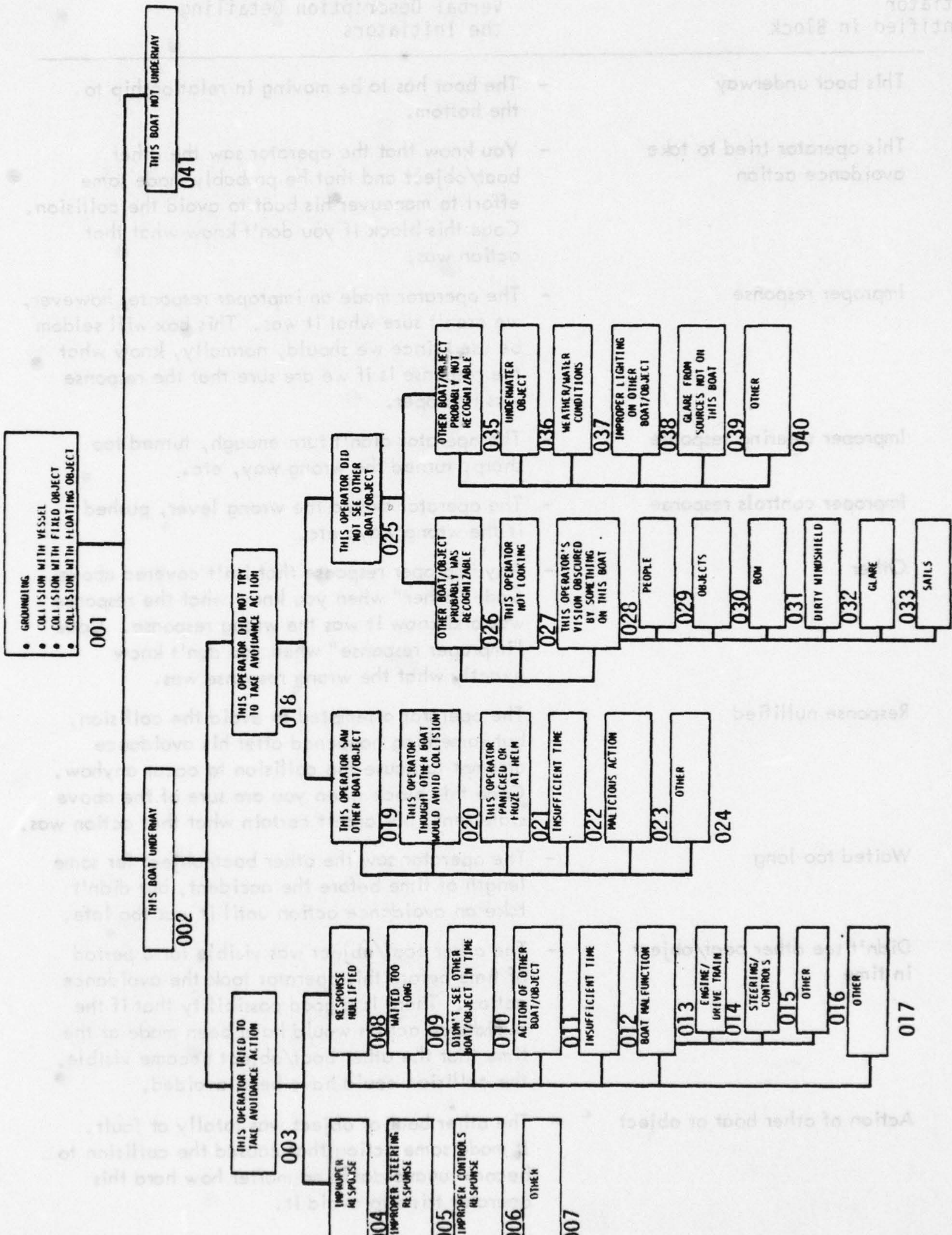
12. Sautkulis, C., J. Bowman, B. Smith, and R. MacNeill, Estimate of the Potential Benefit of the Pressure Relief Vent/Flame Deflector Concept Using In-depth Accident Investigations, Wyle Laboratories Final Report, 1977, NTIS No. AD A045 402.

13. Shikoh, A., and J. Bowman, WATS Accidents Reported in 1975 - A Summary of The Accident Alert Reports, Wyle Laboratories Interim Report, 1976.

14. MacNeill, R., C. Stiehl, and S. Cohen, Recreational Boat Safety Collision Research - Phase II, Wyle Laboratories Interim Report, October, 1975.

15. MacNeill, R., C. Stiehl, and S. Cohen, Collision Research - Phase II, Wyle Laboratories Interim Report No. 2, January, 1976.

APPENDIX A. ACCIDENT CAUSE ANALYSIS INSTRUMENTATION (TREES AND ACCOMPANYING VERBAL DEFINITIONS)



APPENDIX A-1. CAUSE ANALYSIS TREE FOR GROUNDINGS, COLLISION...

APPENDIX A-2. DEFINITIONS FOR GROUNDINGS/COLLISIONS

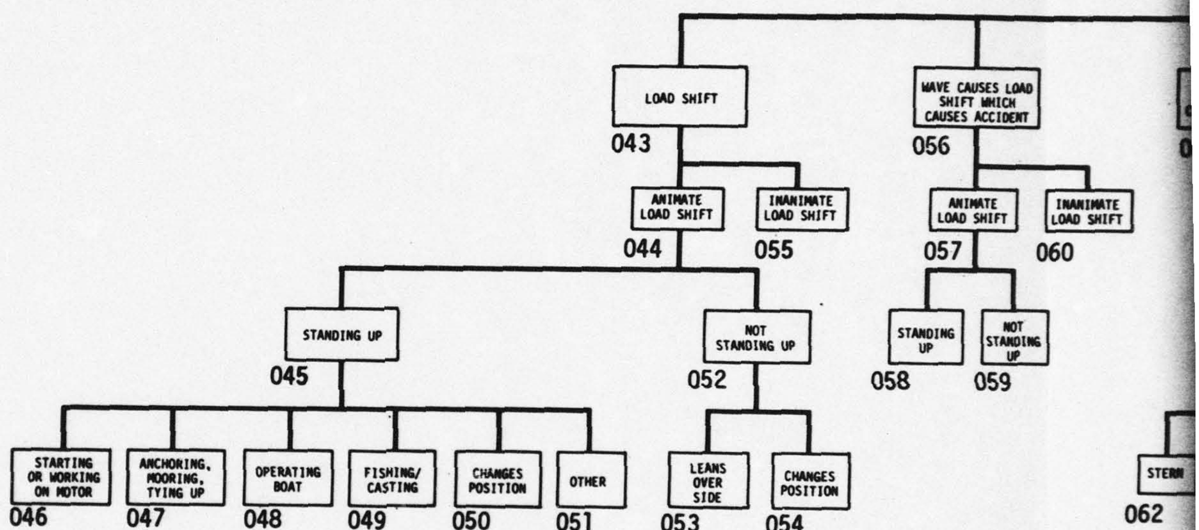
Initiator Identified in Block			Verbal Description Detailing the Initiators
002	This boat underway	-	The boat has to be moving in relationship to the bottom.
003	This operator tried to take avoidance action	-	You know that the operator saw the other boat/object and that he probably made some effort to maneuver his boat to avoid the collision. Code this block if you don't know what that action was.
004	Improper response	-	The operator made an improper response; however, we aren't sure what it was. This box will seldom be used since we should, normally, know what the response is if we are sure that the response was improper.
005	Improper steering response	-	The operator didn't turn enough, turned too sharp, turned the wrong way, etc.
006	Improper controls response	-	The operator moved the wrong lever, pushed it the wrong way, etc.
007	Other	-	Any improper response that isn't covered above. Code "other" when you know what the response was and know it was the wrong response. Code "improper response" when you don't know exactly what the wrong response was.
008	Response nullified	-	The operator attempted to avoid the collision, but something happened after his avoidance attempt to cause the collision to occur anyhow. Code this block when you are sure of the above statement, but aren't certain what that action was.
009	Waited too long	-	The operator saw the other boat/object for some length of time before the accident, but didn't take an avoidance action until it was too late.
010	Didn't see other boat/object in time	-	The other boat/object was visible for a period of time before this operator took the avoidance action. There is a good possibility that if the avoidance action would have been made at the time that the other boat/object became visible, the collision could have been avoided.
011	Action of other boat or object	-	The other boat or object was totally at fault. It made some action that caused the collision to become unavoidable no matter how hard this operator tried to avoid it.

APPENDIX A-2. (continued)

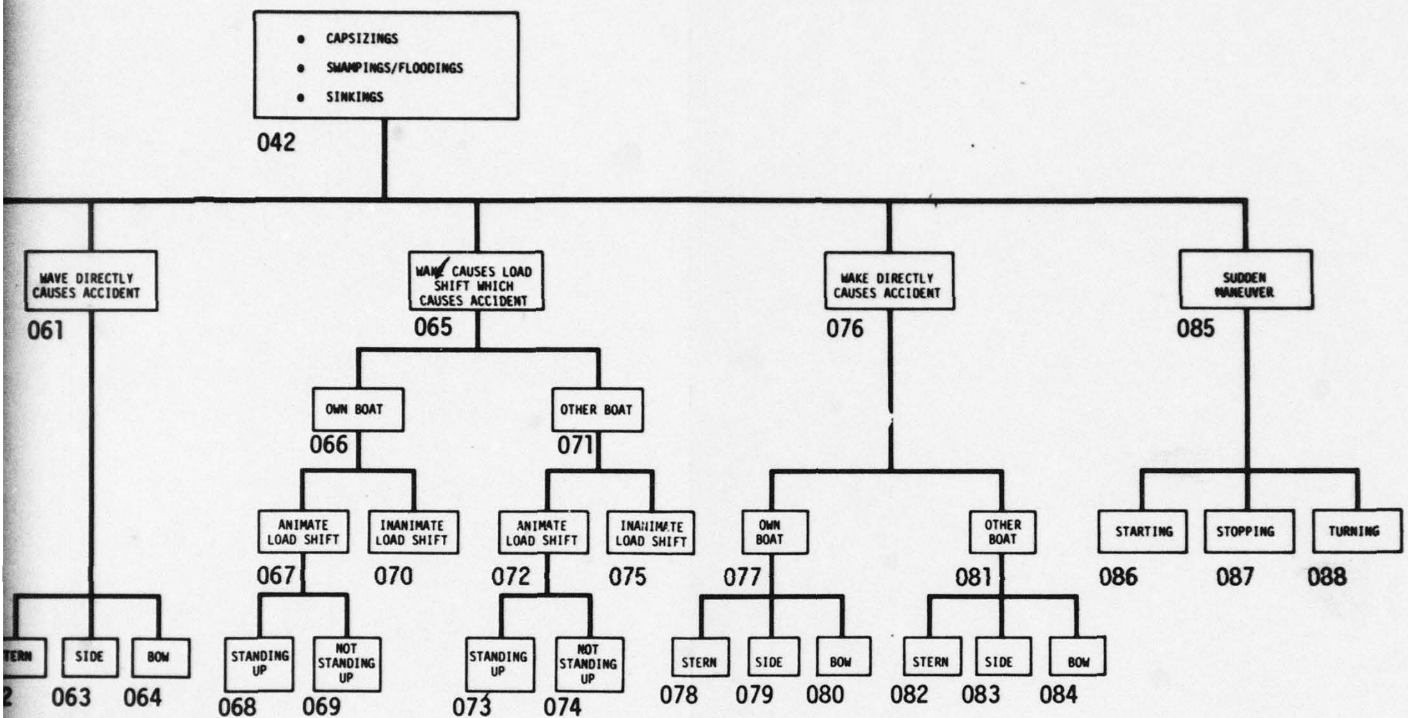
012	Insufficient time	- For some reason, the period of time between the time that the other boat/object first became visible and the time that the collision occurred was so short that the avoidance action was ineffective.
013	Boat malfunction	- Something on the boat malfunctioned causing the avoidance action to be ineffective. Code this block when you aren't certain what actually failed.
014	Engine/Drive train	- The failure that caused the avoidance action to be ineffective was in one or more of the following systems: engine or any attached accessories, gear box, propeller shaft, strut, propeller, rudder, outdrive, or attachment mechanisms.
015	Steering/Controls	- The failure that caused the avoidance action to be ineffective was in one or more of the following systems: steering wheel, steering wheel mechanism, steering cables or pulleys, steering attachment at the rudder end, shift or throttle controls, mechanisms, cables, pulleys or attachment mechanisms.
016	Other	- Something on the boat malfunctioned causing the avoidance action to be ineffective. Code this block when you know what malfunctioned and it was something other than engine/drive train or steering/controls.
017	Other	- The operator took an avoidance action, but that action was nullified by anything other than what is detailed above.
018	This operator did not try to take avoidance action	- Code this block when the probability exists that this operator did not try to take any avoidance action, but you don't know why. You don't know if this operator saw the other boat/object.
019	This operator saw other boat/object	- You know that this operator did not try to take any avoidance action and he did see the other boat/object. You don't know why he did not take avoidance action.
020	This operator thought other boat would avoid collision	- This operator did not try to take any avoidance action even though he saw the other boat because he thought the operator of the other boat would maneuver to avoid the collision.

021	This operator panicked or froze at helm	- This operator did not try to avoid the collision even though he saw the other boat/object because he panicked or froze at the helm.
022	Insufficient time	- The other boat/object appeared so suddenly that there wasn't enough time to take a collision avoidance action.
023	Malicious action	- This operator deliberately tried to place his boat in the collision situation. It may have been because of a dislike for the other person or a desire to see him suffer or it may have been a causeless mischievous impulse.
024	Other	- You know that the other boat/object was seen. You also know that the collision avoidance action was not made for a reason other than those listed above.
025	This operator did not see other boat/object	- You know that this operator did not try to take any avoidance action and he did not see the other boat/object. You don't know why he did not see the other boat/object.
026	Other boat/object probably was recognizable	- You feel certain that the other boat/object could have been seen by most people in the identical situation. Code this block if you don't know why this operator didn't see the other boat/object.
027	This operator not looking	- This operator did not see the other boat/object because he wasn't looking in that direction just prior to the collision.
028	This operator's vision obscured by something on this boat	- The other boat/object was probably recognizable, but this operator didn't see it because of an obstruction on this boat. You aren't sure what was in his line of sight.
029	People	- This operator didn't see the other boat/object because people on this boat were obstructing his view.
030	Objects	- This operator didn't see the other boat/object because an object on this boat obstructed his view.
031	Bow	- This operator didn't see the other boat/object because this boat's bow obstructed his view.
032	Dirty windshield	- This operator didn't see the other boat/object because of spray, salt, dirt, etc., on this boat's windshield.

033	Glare	- This operator didn't see the other boat/object because of glare problems. This can be reflected glare off the water, or off something on this boat. It can also be direct glare from the sun, moon, or any light source.
034	Sails	- This operator didn't see the other boat/object because this boat's sails obstructed his view.
035	Other boat/object probably was not recognizable	- You feel certain that the other boat/object could not have been seen by most people in the identical situation. Code this block if you don't know the reason that it could not have been seen.
036	Underwater object	- This boat hit an underwater object that was not recognizable.
037	Weather/Water conditions	- This operator did not see the other boat/object because the weather conditions or water conditions were so severe. This includes rain, fog, snow, and high waves and assumes that the boat was equipped with weather protection devices normal to similar craft.
038	Improper lighting on other boat/object	- Other boat/object probably was not recognizable by the majority of boaters because it was improperly lighted or not lighted at all.
039	Glare from sources not on this boat	- The other boat/object probably was not recognizable because of glare or lights on the shoreline, on bridges, or causeways or any other source that could effectively mask the navigation lights or the shape of the other boat.
040	Other	- The other boat/object was not recognizable for a reason other than that detailed above.
041	This boat not underway	- The boat is not moving relative to the bottom. The power may be on and, in fact, it may be in gear, but it isn't moving over the bottom.



LOAD SHIFT
043
WAVE CAUSES LOAD SHIFT WHICH CAUSES ACCIDENT
056
ANIMATE LOAD SHIFT
044
INANIMATE LOAD SHIFT
055
ANIMATE LOAD SHIFT
057
INANIMATE LOAD SHIFT
060
STANDING UP
045
NOT STANDING UP
052
STANDING UP
058
NOT STANDING UP
059
STARTING OR WORKING ON MOTOR
046
ANCHORING, MOORING, TYING UP
047
OPERATING BOAT
048
FISHING/CASTING
049
CHANGES POSITION
050
OTHER
051
LEANS OVER SIDE
053
CHANGES POSITION
054
STERN
062



APPENDIX A-3. CAUSE ANALYSIS TREE FOR CAPSIZINGS, SWAMPING/FLOODING, AND SINKING ACCIDENTS

APPENDIX A-4. (continued)

053	Leans over side	The person was not standing but was leaning over the side of the boat involved.
054	Changes Position	The person was not standing but was changing from one location in the boat to another.
055	Inanimate Load Shift	The shift or change in the distribution of load in the boat was the result of some piece of equipment, etc., on board that changed the distribution of weight.
056	Wave Causes Load Shift Which Causes Accident	A wave or wave conditions resulted in some change in the load distribution of the boat.
057	Animate Load Shift	The wave or wave conditions resulted in some change in posture, position, or behavior of persons or animals in the boat (which in turn changed the load distribution of the boat).
058	Standing Up	At the time of the occurrence of the wave(s), the person(s) involved was/were standing in the boat.
059	Not Standing Up	At the time of the occurrence of the wave(s), the person(s) involved was/were not standing in the boat.
060	Inanimate Load Shift	The shift or change in the distribution of load in the boat was the result of some piece of equipment, etc., on board that changed the distribution of weight.
061	Wave Directly Causes Accident	A wave or waves were of sufficient size, coming from an unpredicted direction, etc., that their encounter with the boat directly caused the accident.
062	Stern	The wave or waves first contacted or entered the boat at the stern. This refers to the wave or waves that actually caused the accident, not necesarily the first wave or waves encountered.
063	Side	The wave or waves first contacted or entered the boat at one of the boat's sides. This refers to the wave or waves that actually caused the accident, not necessarily the first wave or waves encountered.

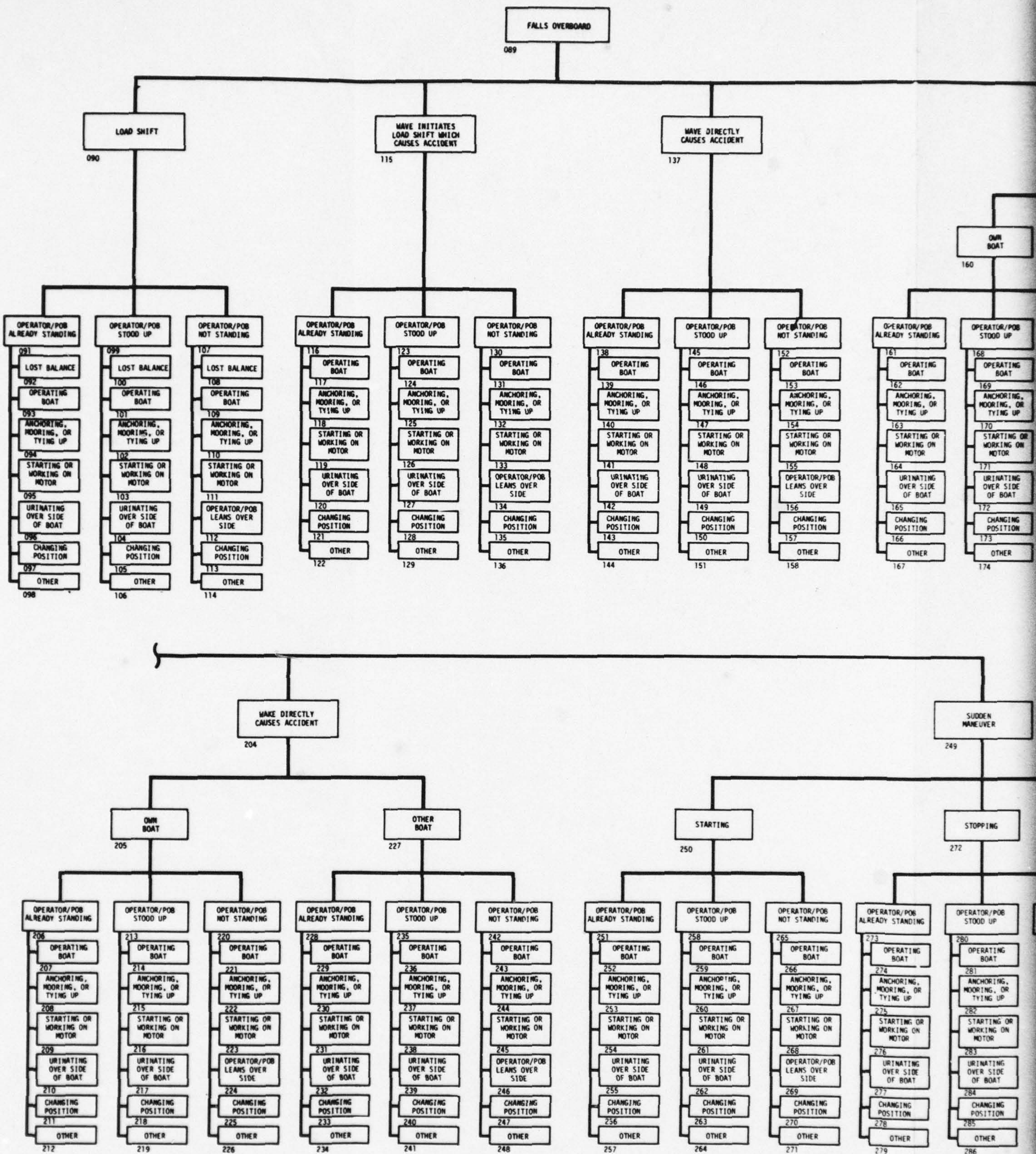
APPENDIX A-4. DEFINITIONS FOR CAPSIZINGS, SWAMPING/FLOODING, AND SINKING ACCIDENTS

Initiator Identified in Block		Verbal Description Detailing the Initiators
042	Capsizing, swamping/flooding, or sinking accident initiated	
043	Load Shift	A shift or change in the distribution of weight in the boat caused the boat to overturn or to begin shipping water.
044	Animate Load Shift	The shift or change in the distribution of weight in the boat was the result of behavior of persons or animals aboard.
045	Standing Up	The load shift resulted from a person or persons who were standing up at the time of the change in distribution of weight.
046	Starting or working on motor	The person standing was in the process of starting or working on the motor.
047	Anchoring, mooring, or tying up	The person standing was in the process of anchoring or tying up the boat involved.
048	Operating Boat	The person standing was in the process of operating the boat involved.
049	Fishing/casting	The person standing was in the process of fishing or casting a line from the boat involved.
050	Changes Position	The person standing was in the process of changing from one location in the boat to another.
051	Other	Any standing person's behavior in the boat involved that resulted in a change in weight distribution and was not covered in the other alternatives should be included here.
052	Not Standing Up	The load shift resulted from a person or persons who were not standing up at the time of the change in distribution of weight.

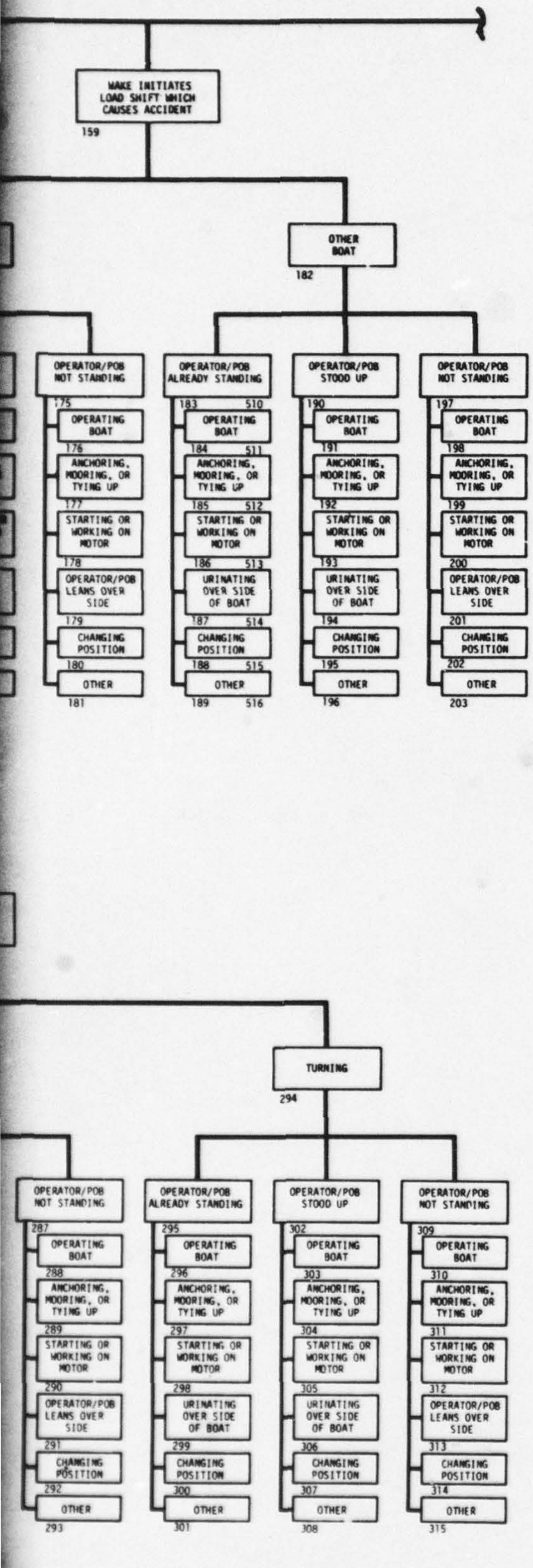
064	Bow	The wave or waves first contacted or entered the boat at the bow. This refers to the wave or waves that actually caused the accident, not necessarily the first wave or waves encountered.
065	Wake Causes Load Shift Which Causes Accident	A wake or wake turbulence resulted in some change in the load distribution of the boat.
066	Own Boat	The wake was caused by the victim's own boat.
067	Animate Load Shift	The wake resulted in some change in posture, position, or behavior of persons or animals (which in turn changed the load distribution of the boat).
068	Standing Up	At the time of the occurrence of the wake, the person(s) involved was/were standing in the boat.
069	Not Standing Up	At the time of the occurrence of the wake, the person(s) involved was/were not standing in the boat.
070	Inanimate Load Shift	The shift or change in the distribution of load in the boat was the result of some peice of equipment, etc., on board that changed the distribution of weight.
071	Other Boat	The wake was caused by a boat other than the victim's boat.
072	Animate Load Shift	The shift or change in the distribution of weight in the boat was the result of behavior of persons or animals aboard.
073	Standing Up	The load shift resulted from a person or persons who were standing up at the time of the change in distribution of weight.
074	Not Standing Up	The load shift resulted from a person or persons who were not standing up at the time of the change in distribution of weight.
075	Inanimate Load Shift	The shift or change in the distribution of load in the boat was the result of some piece of equipment, etc., on board that changed the distribution of weight.

APPENDIX A-4. (concluded)

076	Wake Directly Causes Accident	A wake or wake turbulence was of sufficient size, coming at an unpredictable time, etc., that the encounter with the boat directly caused the accident.
077	Own Boat	The wake was caused by the victim's own boat.
078	Stern	The wake first contacted or entered the boat at the stern. This does not mean this is the first wake encountered, rather this wake actually caused the accident.
079	Side	The wake first contacted or entered the boat at one of the boat's sides. This does not mean this is the first wake encountered, rather this wake actually caused the accident.
080	Bow	The wake first contacted or entered the boat at the bow. This does not mean this is the first wake encountered, rather this wake actually caused the accident.
081	Other Boat	The wake was caused by a boat other than the victim's boat.
082	Stern	The wake first contacted or entered the boat at the stern. This does not mean this is the first wake encountered, rather this wake actually caused the accident.
083	Side	The wake first contacted or entered the boat at one of the boat's sides. This does not mean this is the first wake encountered, rather this wake actually caused the accident.
084	Bow	The wake first contacted or entered the boat at the bow. This does not mean this is the first wake encountered, rather this wake actually caused the accident.
085	Sudden Maneuver	The operator performed an unexpected or rapidly executed maneuver of the boat.
086	Starting	The operator unexpectedly started the boat in motion or rapidly accelerated the boat.
087	Stopping	The operator unexpectedly stopped the boat or rapidly decelerated the boat.
088	Turning	The operator unexpectedly turned the boat or very sharply turned the boat.



FALLS OVERBOARD
089
LOAD SHIFT
090
WAVE INITIATES LOAD SHIFT WHICH CAUSES ACCIDENT
115
WAVE DIRECTLY CAUSES ACCIDENT
137
OWN BOAT
160
OPERATOR/POB ALREADY STANDING
091
LOST BALANCE
092
OPERATING BOAT
093
ANCHORING, MOORING, OR TYING UP
094
STARTING OR WORKING ON MOTOR
095
URINATING OVER SIDE OF BOAT
096
CHANGING POSITION
097
OTHER
098
OPERATOR/POB STOOD UP
099
LOST BALANCE
100
OPERATING BOAT
101
ANCHORING, MOORING, OR TYING UP
102
STARTING OR WORKING ON MOTOR
103
URINATING OVER SIDE OF BOAT
104
CHANGING POSITION
105
OTHER
106
OPERATOR/POB NOT STANDING
107
LOST BALANCE
108
OPERATING BOAT
109
ANCHORING, MOORING, OR TYING UP
110
STARTING OR WORKING ON MOTOR
111
OPERATOR/POB LEANS OVER SIDE
112
CHANGING POSITION
113
OTHER
114
OPERATOR/POB ALREADY STANDING
116
OPERATING BOAT
117
ANCHORING, MOORING, OR TYING UP
118
STARTING OR WORKING ON MOTOR
119
URINATING OVER SIDE OF BOAT
120
CHANGING POSITION
121
OTHER
122
OPERATOR/POB STOOD UP
123
OPERATING BOAT
124
ANCHORING, MOORING, OR TYING UP
125
STARTING OR WORKING ON MOTOR
126
URINATING OVER SIDE OF BOAT
127
CHANGING POSITION
128
OTHER
129
OPERATOR/POB NOT STANDING
130
OPERATING BOAT
131
ANCHORING, MOORING, OR TYING UP
132
STARTING OR WORKING ON MOTOR
133
OPERATOR/POB LEANS OVER SIDE
134
CHANGING POSITION
135
OTHER
136
OPERATOR/POB ALREADY STANDING
138
OPERATING BOAT
139
ANCHORING, MOORING, OR TYING UP
140
STARTING OR WORKING ON MOTOR
141
URINATING OVER SIDE OF BOAT
142
CHANGING POSITION
143
OTHER
144
OPERATOR/POB STOOD UP
145
OPERATING BOAT
146
ANCHORING, MOORING, OR TYING UP
147
STARTING OR WORKING ON MOTOR
148
URINATING OVER SIDE OF BOAT
149
CHANGING POSITION
150
OTHER
151
OPERATOR/POB NOT STANDING
152
OPERATING BOAT
153
ANCHORING, MOORING, OR TYING UP
154
STARTING OR WORKING ON MOTOR
155
OPERATOR/POB LEANS OVER SIDE
156
CHANGING POSITION
157
OTHER
158
OPERATOR/POB ALREADY STANDING
161
OPERATING BOAT
162
ANCHORING, MOORING, OR TYING UP
163
STARTING OR WORKING ON MOTOR
164
URINATING OVER SIDE OF BOAT
165
CHANGING POSITION
166
OTHER
167
OPERATOR/POB STOOD UP
168
OPERATING BOAT
169
ANCHORING, MOORING, OR TYING UP
170
STARTING OR WORKING ON MOTOR
171
URINATING OVER SIDE OF BOAT
172
CHANGING POSITION
173
OTHER
174
WAKE DIRECTLY CAUSES ACCIDENT
204
OWN BOAT
205
OTHER BOAT
227
SUDDEN MANEUVER
249
STARTING
250
STOPPING
272
OPERATOR/POB ALREADY STANDING
206
OPERATING BOAT
207
ANCHORING, MOORING, OR TYING UP
208
STARTING OR WORKING ON MOTOR
209
URINATING OVER SIDE OF BOAT
210
CHANGING POSITION
211
OTHER
212
OPERATOR/POB STOOD UP
213
OPERATING BOAT
214
ANCHORING, MOORING, OR TYING UP
215
STARTING OR WORKING ON MOTOR
216
URINATING OVER SIDE OF BOAT
217
CHANGING POSITION
218
OTHER
219
OPERATOR/POB NOT STANDING
220
OPERATING BOAT
221
ANCHORING, MOORING, OR TYING UP
222
STARTING OR WORKING ON MOTOR
223
OPERATOR/POB LEANS OVER SIDE
224
CHANGING POSITION
225
OTHER
226
OPERATOR/POB ALREADY STANDING
228
OPERATING BOAT
229
ANCHORING, MOORING, OR TYING UP
230
STARTING OR WORKING ON MOTOR
231
URINATING OVER SIDE OF BOAT
232
CHANGING POSITION
233
OTHER
234
OPERATOR/POB STOOD UP
235
OPERATING BOAT
236
ANCHORING, MOORING, OR TYING UP
237
STARTING OR WORKING ON MOTOR
238
URINATING OVER SIDE OF BOAT
239
CHANGING POSITION
240
OTHER
241
OPERATOR/POB NOT STANDING
242
OPERATING BOAT
243
ANCHORING, MOORING, OR TYING UP
244
STARTING OR WORKING ON MOTOR
245
OPERATOR/POB LEANS OVER SIDE
246
CHANGING POSITION
247
OTHER
248
OPERATOR/POB ALREADY STANDING
251
OPERATING BOAT
252
ANCHORING, MOORING, OR TYING UP
253
STARTING OR WORKING ON MOTOR
254
URINATING OVER SIDE OF BOAT
255
CHANGING POSITION
256
OTHER
257
OPERATOR/POB STOOD UP
258
OPERATING BOAT
259
ANCHORING, MOORING, OR TYING UP
260
STARTING OR WORKING ON MOTOR
261
URINATING OVER SIDE OF BOAT
262
CHANGING POSITION
263
OTHER
264
OPERATOR/POB NOT STANDING
265
OPERATING BOAT
266
ANCHORING, MOORING, OR TYING UP
267
STARTING OR WORKING ON MOTOR
268
OPERATOR/POB LEANS OVER SIDE
269
CHANGING POSITION
270
OTHER
271
OPERATOR/POB ALREADY STANDING
273
OPERATING BOAT
274
ANCHORING, MOORING, OR TYING UP
275
STARTING OR WORKING ON MOTOR
276
URINATING OVER SIDE OF BOAT
277
CHANGING POSITION
278
OTHER
279
OPERATOR/POB STOOD UP
280
OPERATING BOAT
281
ANCHORING, MOORING, OR TYING UP
282
STARTING OR WORKING ON MOTOR
283
URINATING OVER SIDE OF BOAT
284
CHANGING POSITION
285
OTHER
286



APPENDIX A-5. CAUSE ANALYSIS TREE FOR FALLS OVERBOARD ACCIDENTS

APPENDIX A-6. DEFINITIONS FOR FALLS OVERBOARD ACCIDENTS

Initiator Identified in Block		Verbal Description Detailing the Initiators
090	Load Shift	A shift or change in the distribution of weight in the boat caused the victim to fall overboard.
091	Operator/POB Already Standing	The change in distribution of weight in the boat occurred when the victim was standing up. This person had been standing for some time.
092	Lost Balance	The victim was standing when he lost his balance for some reason. The reason may or may not be given in the accident report.
093	Operating Boat	The victim was standing, and was in the process of operating the boat involved.
094	Anchoring, mooring, or tying up	The victim was standing, and was in the process of anchoring, mooring, or tying up the boat involved.
095	Starting or working on motor	The victim was standing, and was in the process of starting or working on the motor.
096	Urinating over side of boat	The victim was standing, and was in the process of urinating over the side, bow, or stern of the boat.
097	Changing Position	The victim was standing, and was in the process of changing from one location in the boat to another.
098	Other	Any behavior by the victim, who was standing in the boat, that was known to occur during the change in weight distribution and was not covered in the other alternatives, should be included here.
099	Operator/POB Stood up	The change in distribution of weight in the boat occurred when the victim had just stood up, or was in the act of standing up.
100	Lost Balance	The victim, who just stood up or was in the act of standing up, lost his balance for some reason. The reason may or may not be given in the accident report.

APPENDIX A-6. (continued)

101	Operating Boat	The victim, who just stood up or was in the act of standing up, was in the process of operating the boat.
102	Anchoring, mooring, or tying up	The victim, who just stood up or was in the act of standing up, was anchoring, mooring, or tying up the boat.
103	Starting or working on motor	The victim, who just stood up or was in the act of standing up, was in the process of starting or working on the motor.
104	Urinating over side of boat	The victim, who just stood up or was in the act of standing up, was urinating (or was intending to) over the side, bow, or stern of the boat.
105	Changing Position	The victim, who just stood up or was in the act of standing up, was in the process of changing from one location in the boat to another.
106	Other	Any behavior by the victim, who just stood up or was in the act of standing up, that was known to occur during the change in weight distribution and was not covered in the other alternatives should be included here.
107	Operator/POB Not Standing	The change in distribution of weight in the boat occurred while the victim was not standing or was not in the process of standing up.
108	Lost Balance	The victim was not standing when he lost his balance for some reason. The reason may or may not be given in the accident report.
109	Operating Boat	The victim was not standing, and was in the process of operating the boat involved.
110	Anchoring, mooring, or tying up	The victim was not standing, and was in the process of anchoring, mooring, or tying up the boat involved.
111	Starting or working on motor	The victim was not standing, and was in the process of starting or working on the motor.
112	Operator/POB Leans over side	The victim was not standing, and was leaning over the side of the boat for some reason. The reason may or may not be given in the accident report.

APPENDIX A-6. (continued)

113	Changing Position	The victim was not standing, and was in the process of changing from one location in the boat to another.
114	Other	Any behavior by the victim, who was not standing, that was known to occur during the change in weight distribution and was not covered in the other alternatives, should be included here.
115	Wave Initiates Load Shift Which Causes Accident	A wave initiated a shift or change in the distribution of weight in the boat, which in turn caused the victim to fall overboard.
116	Operator/POB Already Standing	The change in distribution of weight in the boat occurred when the victim was standing up. This person had been standing for some time.
117	Operating Boat	The victim was standing and was in the process of operating the boat involved.
118	Anchoring, mooring or tying up	The victim was standing and was in the process of anchoring, mooring, or tying up the boat involved.
119	Starting or working on motor	The victim was standing and was in the process of starting or working on the motor.
120	Urinating over side of boat	The victim was standing and was in the process of urinating over the side, bow, or stern of the boat.
121	Changing Position	The victim was standing and was in the process of changing from one location in the boat to another.
122	Other	Any behavior by the victim, who was standing in the boat, that was known to occur during the change in weight distribution and was not covered in the other alternatives, should be included here.
123	Operator/POB Stood up	The change in distribution of weight in the boat occurred when the victim had just stood up, or was in the act of standing up.

APPENDIX A-6 (continued)

124	Operating Boat	The victim, who just stood up or was in the act of standing up, was in the process of operating the boat.
125	Anchoring, mooring, or tying up	The victim, who just stood up or was in the act of standing up, was anchoring, mooring, or tying up the boat involved.
126	Starting or working on motor	The victim, who just stood up or was in the act of standing up, was in the process of starting. or working on the motor.
127	Urinating over side of boat	The victim who just stood up or was in the act of standing up, was urinating (or was intending to) over the side, bow, or stern of the boat.
128	Changing Position	The victim, who just stood up or was in the act of standing up, was in the process of changing from one location in the boat to another.
129	Other	Any behavior by the victim, who just stood up or was in the act of standing up, that was known to occur during the change in weight distribution and was not covered in the other alternatives should be included here.
130	Operator/POB Not Standing	The change in distribution of weight in the boat occurred while the victim was not standing or was not in the act of standing up.
131	Operating Boat	The victim was not standing, and was in the process of operating the boat involved.
132	Anchoring, mooring, or tying up	The victim was not standing, and was in the process of anchoring, mooring, or tying up the boat involved.
133	Starting or working on motor	The victim was not standing, and was in the process of starting or working on the motor.
134	Operator/POB Leans over side	The victim was not standing, and was leaning over the side of the boat for some reason. The reason may or may not be given in the accident report.
135	Changing Position	The victim was not standing, and was in the process of changing from one location in the boat to another.

136	Other	Any behavior by the victim, who was not standing, that was known to occur during the change in weight distribution and was not covered in the other alternatives, should be included here.
137	Wave Directly Causes Accident	A wave or waves initiated appreciable motions of the victim's boat, such as pitching, yawing, and/or rolling.
138	Operator/POB Already Standing	The wave or waves occurred when the victim was standing up. This person had been standing for some time.
139	Operating Boat	The victim was standing, and was in the process of operating the boat involved.
140	Anchoring, mooring or tying up	The victim was standing, and was in the process of anchoring, mooring, or tying up the boat involved.
141	Starting or working on motor	The victim was standing, and was in the process of starting or working on the motor.
142	Urinating over side of boat	The victim was standing, and was in the process of urinating over the side, bow, or stern of the boat.
143	Changing Position	The victim was standing, and was in the process of changing from one location in the boat to another.
144	Other	Any behavior by the victim, who was standing in the boat, that was known to occur during the encounter with the wave(s), and was not covered in the other alternatives, should be included here.
145	Operator/POB Stood up	The wave or waves occurred when the victim had just stood up, or was in the process of standing up.
146	Operating Boat	The victim, who just stood up or was in the act of standing up, was in the process of operating the boat.
147	Anchoring, mooring or tying up	The victim, who just stood up or was in the act of standing up, was anchoring, mooring, or tying up the boat involved.

148	Starting or working on motor	The victim, who just stood up or was in the act of standing up, was in the process of starting or working on the motor.
149	Urinating over side of boat	The victim who just stood up or was in the act of standing up, was urinating (or was intending to) over the side, bow, or stern of the boat.
150	Changing Position	The victim, who just stood up or was in act of standing up, was in the process of changing from one location in the boat to another.
151	Other	Any behavior by the victim, who had just stood up or was in the process of standing up, that was known to occur during the encounter with the wave(s), and was not covered in the other alternatives, should be included here.
152	Operator/POB Not Standing	The wave or waves occurred while the victim was not standing or was not in the process of standing up.
153	Operating Boat	The victim was not standing, and was in the process of operating the boat involved.
154	Anchoring, mooring, or tying up	The victim was not standing, and was in the process of anchoring, mooring, or tying up the boat involved.
155	Starting or working on motor	The victim was not standing, and was in the process of starting or working on the motor.
156	Operator/POB Leans over side	The victim was not standing,and was leaning over the side of the boat for some reason. The reason may or may not be given in the accident report.
157	Changing Position	The victim was not standing, and was in the process of changing from one location in the boat to another.
158	Other	Any behavior by the victim, who was not standing, that was known to occur during the encounter with the wave(s), and was not covered in the other alternatives, should be included here.

APPENDIX A-6. (continued)

159	Wake Initiates Load Shift Which Causes Accident	A wake or wake turbulence initiated a change in the distribution of weight in the boat, which in turn caused the victim to fall overboard.
160	Own Boat	The wake initiating the load shift was from the victim's own boat.
161	Operator/POB Already Standing	The wake or wakes occurred when the victim was standing up. This person had been standing for some time.
162	Operating Boat	The victim was standing, and was in the process of operating the boat involved.
163	Anchoring, mooring, or tying up	The victim was standing, and was in the process of anchoring, mooring, or tying up the boat involved.
164	Starting or working on motor	The victim was standing, and was in the process of starting or working on the motor.
165	Urinating over side of boat	The victim was standing, and was in the process of urinating over the side, bow, or stern of the boat.
166	Changing Position	The victim was standing, and was in the process of changing from one location in the boat to another.
167	Other	Any behavior by the victim, who was standing in the boat, that was known to occur during the encounter with the wake(s), and was not covered in the other alternatives, should be included here.
168	Operator/POB Stood up	The wake or wakes occurred when the victim had just stood up, or was in the process of standing up.
169	Operating Boat	The victim, who just stood up or was in the act of standing up, was in the process of operating the boat.
170	Anchoring, mooring, or tying up	The victim, who just stood up or was in the act of standing up, was anchoring, mooring, or tying up the boat.
171	Starting or working on motor	The victim who just stood up or was in the act of standing up, was in the process of starting or working on the motor.

APPENDIX A-6. (continued)

172	Urinating over side of boat	The victim who just stood up or was in the act of standing up, was urinating (or was intending to) over the side, bow, or stern of the boat.
173	Changing Position	The victim, who just stood up or was in the act of standing up, was in the process of changing from one location in the boat to another.
174	Other	Any behavior by the victim, who had just stood up or was in the process of standing up, that was known to occur during the encounter with the wake(s), and was not covered in the other alternatives, should be included here.
175	Operator/POB Not Standing	The wake or wakes occurred while the victim was not standing or was not in the process of standing up.
176	Operating Boat	The victim was not standing, and was in the process of operating the boat involved.
177	Anchoring, mooring, or tying up	The victim was not standing, and was in the process of anchoring, mooring, or tying up the boat involved.
178	Starting or working on motor	The victim was not standing, and was in the process of starting or working on the motor.
179	Operator/POB Leans over side	The victim was not standing, and was leaning over the side of the boat for some reason. The reason may or may not be given in the accident report.
180	Changing Position	The victim was not standing, and was in the process of changing from one location in the boat to another.
181	Other	Any behavior by the victim, who was not standing, that was known to occur during the encounter with the wake(s), and was not covered in the other alternatives, should be included here.
182	Other Boat	The wake initiating the load shift was from a boat other than the victim's.
183	Operator/POB Already Standing	The wake or wakes occurred when the victim was standing up. This person had been standing for some time.

APPENDIX A-6. (continued)

184	Operating Boat	The victim was standing, and was in the of operating the boat involved.
185	Anchoring, mooring, or tying up	The victim was standing, and was in the process of anchoring, mooring, or tying up the boat involved.
186	Starting or working on motor	The victim was standing, and was in the process of starting or working on the motor.
187	Urinating over side of boat	The victim was standing, and was in the process of urinating over the side, bow, or stern of the boat.
188	Changing Position	The victim was standing, and was in the process of changing from one location in the boat to another.
189	Other	Any behavior by the victim, who was standing in the boat, that was known to occur during the encounter with the wake(s), and was not covered in the other alternatives, should be included here.
190	Operator/POB Stood up	The wake or wakes occurred when the victim had just stood up, or was in the process of standing up.
191	Operating Boat	The victim, who just stood up or was in the act of standing up, was in the process of operating the boat.
192	Anchoring, mooring, or tying up	The victim, who just stood up or was in the act of standing up, was anchoring, mooring, or tying up the boat involved.
193	Starting or working on motor	The victim who just stood up or was in the act of standing up, was in the process of starting or working on the motor.
194	Urinating over side of boat	The victim who just stood up or was in the act of standing up, was urinating (or was intending to) over the side, bow, or stern of the boat.
195	Changing Position	The victim, who just stood up or was in the act of standing up, was in the process of changing from one location in the boat to another.

APPENDIX A-6. (continued)

196	Other	Any behavior by the victim, who had just stood up or was in the process of standing up, that was known to occur during the encounter with the wake(s), and was not covered in the other alternatives, should be included here.
197	Operator/POB Not Standing	The wake or wakes occurred while the victim was not standing or was not in the process of standing up.
198	Operating Boat	The victim was not standing, and was in the process of operating the boat involved.
199	Anchoring, mooring, or tying up	The victim was not standing, and was in the process of anchoring, mooring, or tying up the boat involved.
200	Starting or working on motor	The victim was not standing, and was in the process of starting or working on the motor.
201	Operator/POB Leans over side	The victim was not standing, and was leaning over the side of the boat for some reason. The reason may or may not be given in the accident report.
202	Changing Position	The victim was not standing, and was in the process of changing from one location in the boat to another.
203	Other	Any behavior by the victim, who was not standing, that was known to occur during the encounter with the wake(s), and was not covered in the other alternatives, should be included here.
204	Wake Directly Causes Accident	A wake or wake turbulence initiated appreciable motions of the victim's boat, such as pitching, yawing, and/or rolling.
205	Own Boat	The wake initiating appreciable motions of the victim's boat was from his own.
206	Operator/POB Already Standing	The wake occurred when the victim was standing up. This person had been standing for some time.
207	Operating Boat	The victim was standing, and was in the process of operating the boat involved.
208	Anchoring, mooring, or tying up	The victim was standing, and was in the process of anchoring, mooring, or tying up the boat involved.
209	Starting or working on motor	The victim was standing, and was in the process of starting or working on the motor.

210	Urinating over side of boat	The victim was standing, and was in the process of urinating over the side, bow, or stern of the boat.
211	Changing Position	The victim was standing, and was in the process of changing from one location in the boat to another.
212	Other	Any behavior by the victim who was standing in the boat, that was known to occur during the encounter with the wake, and was not covered in the other alternatives, should be included here.
213	Operator/POB Stood up	The wake occurred when the victim had just stood up, or was in the process of standing up.
214	Operating Boat	The victim, who just stood up or was in the act of standing up, was in the process of operating the boat.
215	Anchoring, mooring, or tying up	The victim, who just stood up or was in the act of standing up, was anchoring, mooring, or tying up the boat involved.
216	Starting or working on motor	The victim, who just stood up or was in the act of standing up, was in the process of starting or working on the motor.
217	Urinating over side of boat	The victim, who just stood up or was in the act of standing up, was urinating (or was intending to) over the side, bow, or stern of the boat.
218	Changing Position	The victim, who just stood up or was in the act of standing up, was in the process of changing from one location in the boat to another.
219	Other	Any behavior by the victim who had just stood up or was in the process of standing up, that was known to occur during the encounter with the wake, and was not covered in the other alternatives, should be included here.
220	Operator/POB Not Standing	The wake occurred while the victim was not standing or was not in the process of standing up.

221	Operating Boat	The victim was not standing, and was in the process of operating the boat involved.
222	Anchoring, mooring, or tying up	The victim was not standing, and was in the process of anchoring, mooring, or tying up the boat involved.
223	Starting or working on motor	The victim was not standing, and was in the process of starting or working on the motor.
224	Operator/POB Leans over side	The victim was not standing, and was leaning over the side of the boat for some reason. The reason may or may not be given in the accident report.
225	Changing Position	The victim was not standing, and was in the process of changing from one location in the boat to another.
226	Other	Any behavior by the victim who was not standing or was not in the process of standing up, that was known to occur during the encounter with the wake, and was not covered in the other alternatives, should be included here.
227	Other Boat	The wake initiating appreciable motions of the victim's boat was from another boat.
228	Operator/POB Already Standing	The wake occurred when the victim was standing up. This person had been standing for some time.
229	Operating Boat	The victim was standing, and was in the process of operating the boat involved.
230	Anchoring, mooring, or tying up	The victim was standing, and was in the process of anchoring, mooring, or tying up the boat involved.
231	Starting or working on motor	The victim was standing, and was in the process of starting or working on the motor.
232	Urinating over side of boat	The victim was standing, and was in the process of urinating over the side, bow, or stern of the boat.
233	Changing Position	The victim was standing, and was in the process of changing from one location in the boat to another.

234	Other	Any behavior by the victim who was standing in the boat, that was known to occur during the encounter with the wake, and was not covered in the other alternatives, should be included here.
235	Operator/POB Stood up	The wake occurred when the victim had just stood up, or was in the process of standing up.
236	Operating Boat	The victim, who just stood up or was in the act of standing up, was in the process of operating the boat involved.
237	Anchoring, mooring, or tying up	The victim, who just stood up or was in the act of standing up, was anchoring, mooring, or tying up the boat involved.
238	Starting or working on motor	The victim who just stood up or was in the act of standing up, was in the process of starting or working on the motor.
239	Urinating over side of boat	The victim who just stood up or was in the act of standing up, was urinating (or was intending to) over the side, bow, or stern of the boat.
240	Changing Position	The victim, who just stood up or was in the act of standing up, was in the process of changing from one location in the boat to another.
241	Other	Any behavior by the victim who had just stood up, or was in the process of standing up, that was known to occur during the encounter with the wake, and was not covered in the other alternatives, should be included here.
242	Operator/POB Not Standing	The wake occurred while the victim was not standing or was not in the process of standing up.
243	Operating Boat	The victim was not standing, and was in the process of operating the boat involved.
244	Anchoring, mooring or tying up	The victim was not standing, and was in the process of anchoring, mooring, or tying up the boat involved.
245	Starting or working on motor	The victim was not standing, and was in the process of starting or working on the motor.

246	Operator/POB Leans over side	The victim was not standing, and was leaning over the side of the boat for some reason. The reason may or may not be given in the accident report.
247	Changing Position	The victim was not standing, and was in the process of changing from one location in the boat to another.
248	Other	Any behavior by the victim who was not standing or was not in the process of standing up, that was known to occur during the encounter with the wake, and was not covered in the other alternatives, should be included here.
249	Sudden Maneuver	The operator performed an unexpected or rapidly executed maneuver of the boat.
250	Starting	The operator unexpectedly started the boat in motion or rapidly accelerated the boat.
251	Operator/POB Already Standing	The maneuver occurred when the victim was standing up. This person had been standing for some time.
252	Operating Boat	The victim was standing, and was in the process of operating the boat involved.
253	Anchoring, mooring, or tying up	The victim was standing, and was in the process of anchoring, mooring, or tying up the boat involved.
254	Starting or working on motor	The victim was standing, and was in the process of starting or working on the motor.
255	Urinating over side of boat	The victim was standing, and was in the process of urinating over the side, bow, or stern of the boat.
256	Changing Position	The victim was standing, and was in the process of changing from one location in the boat to another.
257	Other	Any behavior by the victim who was standing in the boat, that was known to occur during the time of the sudden start/acceleration, and was not covered in the other alternatives, should be included here.

APPENDIX A-6. (continued)

258	Operator/POB Stood up	The maneuver occurred when the victim had just stood up, or was in the process of standing up.
259	Operating Boat	The victim, who just stood up or was in the act of standing up, was in the process of operating the boat involved.
260	Anchoring, mooring, or tying up	The victim, who just stood up or was in the act of standing up, was anchoring, mooring, or tying up the boat involved.
261	Starting or working on motor	The victim who just stood up or was in the act of standing up, was in the process of starting or working on the motor.
262	Urinating over side of boat	The victim who just stood up or was in the act of standing up, was urinating (or was intending to) over the side, bow, or stern of the boat.
263	Changing Position	The victim, who just stood up or was in the act of standing up, was in the process of changing from one location in the boat to another.
264	Other	Any behavior by the victim who had just stood up, or was in the process of standing up, that was known to occur during the time of the sudden start/acceleration, and was not covered in the other alternatives, should be included here.
265	Operator/POB Not Standing	The maneuver occurred while the victim was not standing or was not in the process of standing up.
266	Operating Boat	The victim was not standing, and was in the process of operating the boat involved.
267	Anchoring, mooring, or tying up	The victim was not standing, and was in the process of anchoring, mooring, or tying up the boat involved.
268	Starting or working on motor	The victim was not standing, and was in the process of starting or working on the motor.
269	Operator/POB Leans over side	The victim was not standing, and was leaning over the side of the boat for some reason. The reason may or may not be given in the accident report.
270	Changing Position	The victim was not standing, and was in the process of changing from one location in the boat to another.

271	Other	Any behavior by the victim who was not standing or was not in the process of standing up, that was known to occur during the time of the sudden start/acceleration, and was not covered in the other alternatives, should be included here.
272	Stopping	The operator unexpectedly stopped the boat or rapidly decelerated the boat.
273	Operator/POB Already Standing	The maneuver occurred when the victim was standing up. This person had been standing for some time.
274	Operating Boat	The victim was standing, and was in the process of operating the boat involved.
275	Anchoring, mooring, or tying up	The victim was standing, and was in the process of anchoring, mooring, or tying up the boat involved.
276	Starting or working on motor	The victim was standing, and was in the process of starting or working on the motor.
277	Urinating over side of boat	The victim was standing, and was in the process of urinating over the side, bow, or stern of the boat.
278	Changing Position	The victim was standing, and was in the process of changing from one location in the boat to another.
279	Other	Any behavior by the victim who was standing in the boat, that was known to occur during the time of the sudden stop/deceleration, and was not covered in the other alternatives, should be included here.
280	Operator/POB Stood up	The maneuver occurred when the victim had just stood up, or was in the process of standing up.
281	Operating Boat	The victim, who just stood up or was in the act of standing up, was in the process of operating the boat involved.
282	Anchoring, mooring, or tying up	The victim, who just stood up or was in the act of standing up, was anchoring, mooring, or tying up the boat involved.

APPENDIX A-6. (continued)

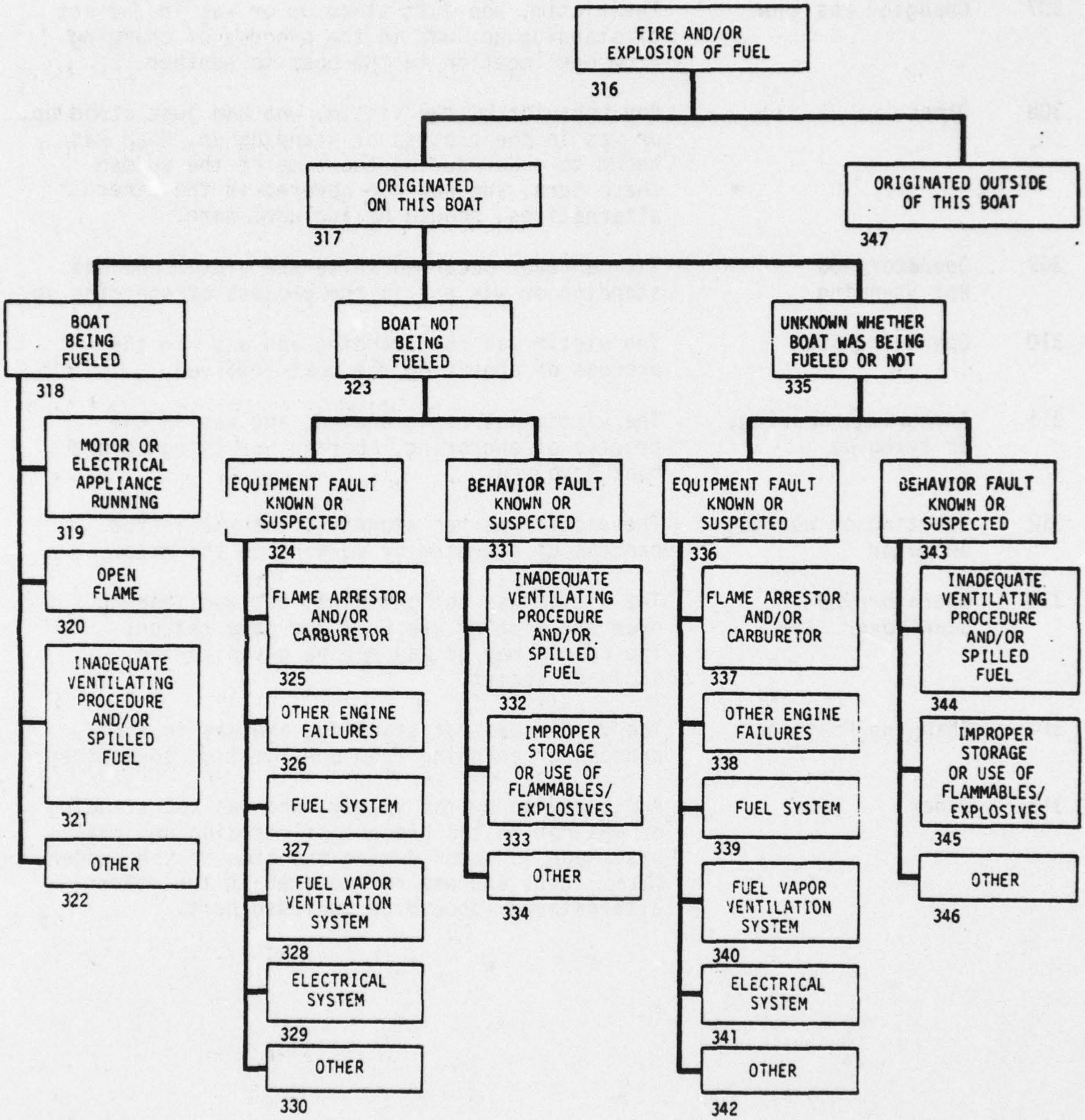
283	Starting or working on motor	The victim, who just stood up or was in the act of standing up, was in the process of starting or working on the motor.
284	Urinating over side of boat	The victim, who just stood up or was in the act of standing up, was urinating (or was intending to) over the side, bow, or stern of the boat.
285	Changing Position	The victim, who just stood up or was in the act of standing up, was in the process of changing from one location in the boat to another.
286	Other	Any behavior by the victim, who had just stood up, or was in the process of standing up, that was known to occur during the time of the sudden stop/deceleration, and was not covered in the other alternatives, should be included here.
287	Operator/POB Not Standing	The maneuver occurred while the victim was not standing or was not in the process of standing up.
288	Operating Boat	The victim was not standing, and was in the process of operating the boat involved.
289	Anchoring, mooring, or tying up	The victim was not standing, and was in the process of anchoring, mooring, or tying up the boat involved.
290	Starting or working on motor	The victim was not standing, and was in the process of starting or working on the motor.
291	Operator/POB Leans over side	The victim was not standing, and was leaning over the side of the boat for some reason. The reason may or may not be given in the accident report.
292	Changing Position	The victim was not standing, and was in the process of changing from one location in the boat to another.
293	Other	Any behavior by the victim, who was not standing or was not in the process of standing up, that was known to occur during the time of the sudden stop/deceleration, and was not covered in the other alternatives, should be included here.

APPENDIX A-6. (continued)

294	Turning	The operator unexpectedly turned the boat or very sharply turned the boat.
295	Operator/POB Already Standing	The maneuver occurred when the victim was standing up. This person had been standing for some time.
296	Operating Boat	The victim was standing, and was in the process of operating the boat involved.
297	Anchoring, mooring, or tying up	The victim was standing, and was in the process of anchoring, mooring, or tying up the boat involved.
298	Starting or working on motor	The victim was standing, and was in the process of starting or working on the motor.
299	Urinating over side of boat	The victim was standing, and was in the process of urinating over the side, bow, or stern of the boat.
300	Changing Position	The victim was standing, and was in the process of changing from one location in the boat to another.
301	Other	Any behavior by the victim who was standing in the boat, that was known to occur during the time of the sudden sharp turn, and was not covered in the other alternatives, should be included here.
302	Operator/POB Stood up	The maneuver occurred when the victim had just stood up, or was in the process of standing up.
303	Operating Boat	The victim, who just stood up or was in the act of standing up, was in the process of operating the boat involved.
304	Anchoring, mooring, or tying up	The victim, who just stood up or was in the act of standing up, was anchoring, mooring, or tying up the boat involved.
305	Starting or working on motor	The victim, who just stood up or was in the act of standing up, was in the process of starting or working on the motor.
306	Urinating over side of boat	The victim, who just stood up or was in the act of standing up, was urinating (or was intending to) over the side, bow, or stern of the boat.

APPENDIX A-6. (concluded)

307	Changing Position	The victim, who just stood up or was in the act of standing up, was in the process of changing from one location in the boat to another.
308	Other	Any behavior by the victim, who had just stood up, or was in the process of standing up, that was known to occur during the time of the sudden sharp turn, and was not covered in the other alternatives, should be included here.
309	Operator/POB Not Standing	The maneuver occurred while the victim was not standing or was not in the process of standing up.
310	Operating Boat	The victim was not standing and was in the process of operating the boat involved.
311	Anchoring, mooring, or tying up	The victim was not standing, and was in the process of anchoring, mooring, or tying up the boat involved.
312	Starting or working on motor	The victim was not standing, and was in the process of starting or working on the motor.
313	Operator/POB Leans over side	The victim was not standing, and was leaning over the side of the boat for some reason. The reason may or may not be given in the accident report.
314	Changing Position	The victim was not standing, and was in the process of changing from one location to another.
315	Other	Any behavior by the victim, who was not standing or was not in the process of standing up, that was known to occur during the time of the sudden sharp turn, and was not covered in the other alternatives, should be included here.



APPENDIX A-7. CAUSE ANALYSIS TREE FOR FIRES AND/OR EXPLOSIONS OF FUEL

APPENDIX A-8. CODING INSTRUCTIONS FOR FIRES AND/OR EXPLOSIONS OF FUEL

Because there is frequently little information available from BARs and because evidence is often destroyed by the fire/explosion itself (or sinking of the boat), this cause analysis tree is intended to use any information given which suggests a given cause, even if such is not specifically stated. Therefore, the coder must often infer what has happened from very slight evidence. In some cases more than one condition can be identified as having contributed to the accident. In this case, one must be singled out for coding purposes. In choosing the proper code, consider these factors:

1) Both fuel and spark must have been present for a fire/explosion to occur. Sometimes both sources are identified (e.g., "ruptured gas tank and engine backfired"). Since sparks are frequently present around even well-maintained engines, the addition of sufficient loose fuel or fuel vapors to cause a fire/explosion can be considered the direct cause of the accident. So this accident would be coded "fuel system."

2) This cause analysis tree is designed to be used for safety education purposes. If there are several factors which appear to have contributed to the accident, and one involved improper operator behavior, then assign the primary fault to that. If more than one behavioral fault is involved, select the one which is most directly responsible for the fire/explosion, in the sense that, had the operator behaved differently, this particular accident might have been averted.

Another example: the statement on the BAR is "fuel in bilge and faulty wiring." There may be either a fault in the fuel system <u>or</u> a failure to ventilate, <u>and</u> the electrical system is faulty. We do know the latter, so this accident is coded in Box 341 (fault in electrical system).

But, if the BAR says "started motor-explosion; fuel in bilge and faulty wiring," then we can infer in addition to the information known for the first example, that the operator did not ensure that his bilge was clean of fuel/fuel vapors prior to starting his engine. Had he done so, he would have averted the accident, <u>at least at that particular time</u>. Therefore, this second example would be coded in Box 344 (inadequate ventilating procedure and/or spilled fuel).

APPENDIX A-9. DEFINITIONS FOR FIRES AND/OR EXPLOSIONS OF FUEL

316 Fire and/or Explosion of Fuel - Accidental combustion of liquids, including their vapors, or other substances, such as wood or coal, which are on board as vessel fuel.

317 Originated on This Boat - The fire/explosion initially occurred on the boat being coded, and not from an outside source such as another boat. If the fuel which burned or exploded spilled or leaked onto this boat from an outside source, code the accident in Box 6.

318 Boat Being Fueled - The accident occurred at the time fueling procedures were initiated or in progress; or subsequent to fueling on first starting or attempting to start the motor; or turning on an appliance or striking a flame on the boat subsequent to fueling. If the boat had just been fueled, the engines were started, and the boat had left the dock when the accident occurred, do not code it as "boat being fueled." If the accident occurred during fueling, but no further information is known or can be inferred, code this box.

319 Motor or Electrical Appliance Running - If during fueling, the motor or blower or any other electrical appliance was operating.

320 Open Flame - If during fueling, a lighted cigarette was present, or a lighter struck; or an appliance or a pilot light on an appliance such as a stove was on.

321 Inadequate Ventilating Procedure and/or Spilled Fuel - Failure to operate the blower for an adequate time span following fueling; failure to clean up spilled fuel prior to starting engine; failure to ensure that bilges are clear of fuel/fuel vapor prior to starting engine. If no information is available except that the boat exploded when the motor was started subsequent to fueling, code this box. Even if the operator states that he ran the blower for an adequate length of time, an explosion on starting the engine is cause to suspect that he did not ensure that the boat was clear of fuel/fuel vapors.

322 Other - Code this box if a specific cause has been identified which does not fit into 11, 12, or 13, but is known to be fueling-related.

323 Boat Not Being Fueled - The accident did not occur at the time of fueling. This may include fires/explosions which occurred shortly after fueling, but where there is indication that the burning/exploding fuel had not been released at the time the fueling procedure was completed (e.g., the boat had been underway for a couple of minutes). If you know that the accident did not occur at the time of, or immediately subsequent to fueling, but no other information is available or can be inferred, code this box.

324 Equipment Fault Known or Suspected - No operator fault is discernible and equipment malfunction or improper equipment are suggested in the report, but not specifically identifiable (e.g., "boat underway; heard noise-saw flames coming from engine").

325 Flame Arrestor and/or Carburetor - No operator fault is discernible, and the carburetor or a faulty or missing backfire flame arrestor are known or suspected of causing the fire/explosion.

326 Other Engine Failures - No operator fault is discernible and some specific part of the engine is at fault (other than the carburetor or flame arrestor). This includes the engine exhaust hose.

327 Fuel System - No operator fault is discernible and some part of the fuel system is known or suspected to be at fault (including fuel tanks, fuel pump, filters, lines, filler necks, and fittings).

328 Fuel Vapor Ventilation System - No operator fault is discernible, and the fuel vapor ventilation system is suspected or identified as being at fault (including bilge and engine blowers, and ducts).

329 Electrical System - No operator fault is discernible and no source of fuel leakage is identified, but the electrical system or appliances are known or suspected to be at fault (including the alternator or generator, battery, charging system, voltage regulator, wiring, lights, electrical appliance, and electronic navigation gear). Note that if the fire/explosion was only electrical and did not involve vessel fuel, the accident belongs in the category "Fire or Explosion Other than Fuel."

330 Other✓- No operator fault is discernible and some specific equipment fault not included in 22 through 26 is indicated.

331 Behavior Fault Known or Suspected - There is any suggestion that improper operator behavior has occurred, or proper operating procedure omitted, such that proper behavior would have averted this particular accident; even if equipment fault is also present.

332 Inadequate Ventilating Procedure and/or Spilled Fuel - There is evidence that the operator failed to ensure that the boat was clear of spilled fuel or fuel vapors before starting the engine, even if equipment fault is also present. Note that this can be inferred in a report such as "stopped the boat to pick up skier; when restarted the motor, the boat exploded." However, if the boat is not equipped with an adequate ventilation system, code Box 25. Even if the operator states that he ran the blower for an adequate length of time, an explosion on starting the engine is cause to suspect that he did not ensure that the boat was clear of fuel/fuel vapors.

333 Improper Storage or Use of Flammables/Explosives - Improperly stored or misused flammables/explosives caused the accident: Code this box, even if additional equipment fault is present.

334 Other - Specific operator behavior other than listed in 29 and 30 is responsible for the accident, even if equipment fault is also present.

335 Unknown Whether Boat Was Being Fueled or Not - Code this box if no information is available other than that a fire/explosion occurred. Code through this node if further information is available but you are unable to determine whether the boat was being, or had just been, fueled or not.

336 Equipment Fault Known or Suspected - There is no implication of improper operator behavior, and there is some reason to believe that equipment fault was the cause of the accident; but no indication of what specific equipment was to blame.

337 Flame Arrestor and/or Carburetor - No operator fault is discernible, and the carburetor or a faulty or missing backfire flame arrestor are known or suspected to have caused the fire/explosion.

338 Other Engine Failures - No operator fault is discernible, and some specific part of the engine is known or suspected to be at fault (other than the carburetor or flame arrestor). This includes the engine exhaust hose.

339 Fuel System - No operator fault is discernible, and some part of the fuel system is known or suspected to be at fault (including fuel tank, fuel pump, filters, lines, filler necks, and fittings).

340 Fuel Vapor Ventilation System - No operator fault is discernible, and the fuel vapor ventilation system is identified or suspected of being at fault (including bilge and engine blowers, and ducts).

341 Electrical System - No operator fault is discernible, no source of fuel leakage is identified; and the electrical system or appliances are known or suspected to be at fault (including the alternator or generator, battery, charging system, voltage regulator, wiring, lights, electrical appliances, and electronic navigation gear). Note that if the fire/explosion was only electrical and did not involve vessel fuel, the accident belongs in the category "Fire or Explosion Other than Fuel."

342 Other - No operator fault is discernible, and some specific equipment fault not included in 42 through 46 is indicated.

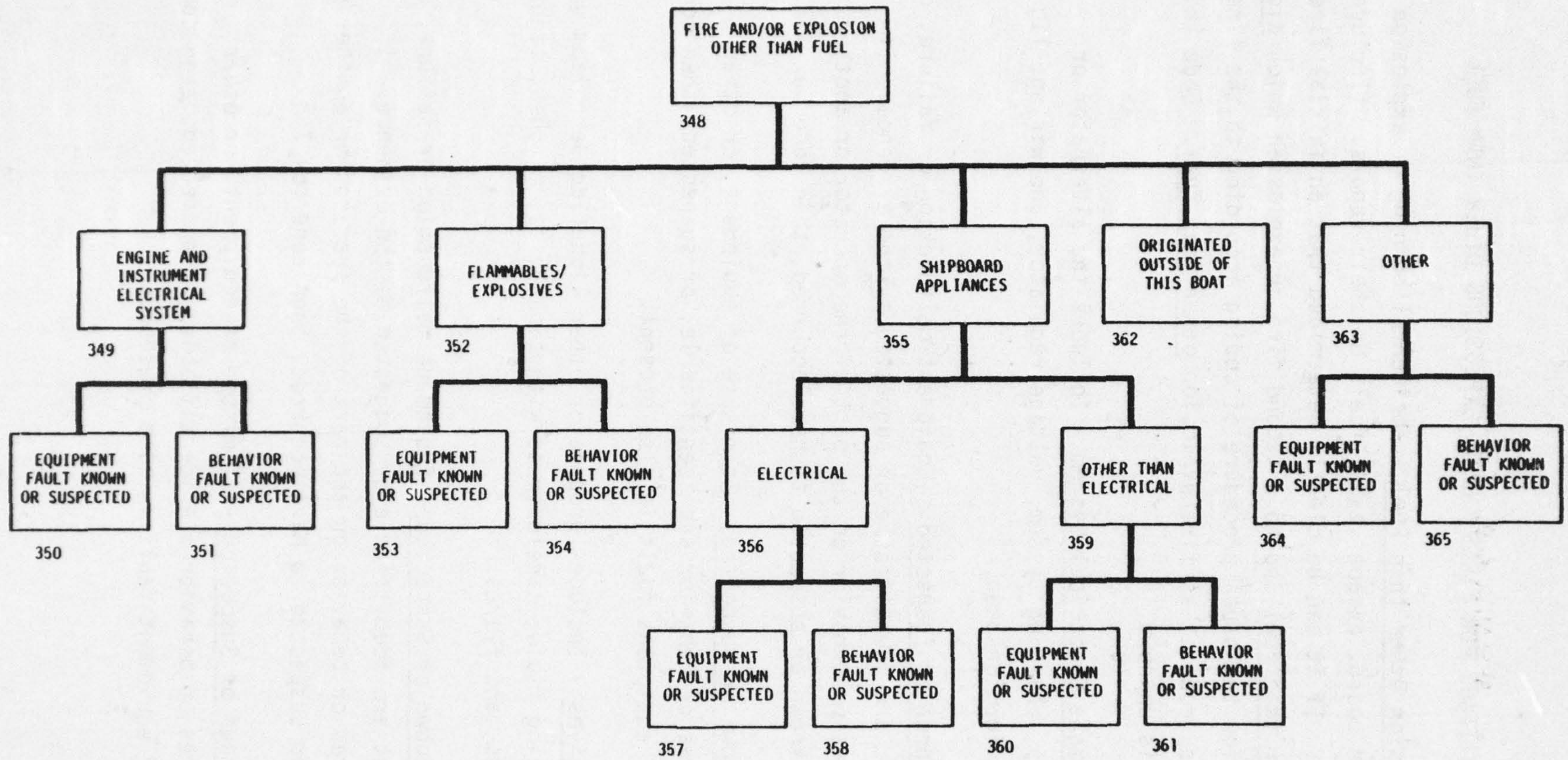
343 Behavior Fault Known or Suspected - There is indication that faulty operator behavior or the lack of proper procedure caused the accident, and had different behavior occurred, the accident would have been averted at this particular time. Code this box even if equipment fault was also present.

344 Inadequate Ventilating Procedure and/or Spilled Fuel - There is evidence that the operator failed to ensure that the boat was clear of spilled fuel/fuel vapor before starting the engine, even if equipment fault is also present. This can be inferred from a report such as, "I started the engine, and the boat blew up." However, if the boat is not equipped with an adequate ventilation system, code Box 45. Even if the operator states that he ran the blower for an adequate length of time, an explosion on starting the engine is cause to suspect that he did not ensure that the boat was clear of fuel/fuel vapors.

345 Improper Storage or Use of Flammables/Explosives - Improperly stored or misused flammables/explosives caused the accident. Code this box, even if additional equipment fault is present.

346 Other - Specific operator behavior other than listed in 49 and 50 is known or suspected of being responsible for the accident, even if equipment fault is also present.

347 Originated Outside of This Boat - The boat was set on fire from an outside source, such as another boat which was burning, or fuel/fuel vapors from another boat spilled or leaked onto this boat and combusted.



APPENDIX A-10. FIRES AND/OR EXPLOSIONS OTHER THAN FUEL

APPENDIX A-11. DEFINITIONS FOR FIRES AND/OR EXPLOSIONS OTHER THAN FUEL

348 Fire and/or Explosion Other than Fuel - Accidental burning or explosion of any material on board, except vessel fuels or their vapors. (Includes electrical fires). If it can be clearly determined that an initial fire or explosion other than fuel led to a second fire or explosion which did involve fuel, follow the usual procedure of coding according to the first incident. That is, code it as fire/explosion other than fuel. Code this box if the cause is unknown.

349 Engine and Instrument Electrical System - Includes the alternator or generator, battery, charging system, voltage regulator, and wiring; lights and electronic navigation gear.

350 Equipment Fault Known or Suspected - Equipment malfunction or failure, or improper equipment are identifiable or suggested by the evidence. If improper procedures or behavior on the part of the operator or another person were also known or suspected to have occurred, then code box 4.

351 Behavior Fault Known or Suspected - If misuse of equipment, or other improper procedures or behavior are identifiable, or suspected, then code this box, even if equipment fault is also present.

352 Flammables/Explosives - Includes propane or other liquefied petroleum gases; paint cans; starting fluid; carelessness with cigarettes, matches, lighters; fire extinguishers, and flares.

353 Equipment Fault Known or Suspected - Equipment malfunction or failure, or improper equipment are identifiable or suggested by the evidence. If improper procedures or behavior on the part of the operator or another person were also known or suspected to have occurred, then code box 7.

354 Behavior Fault Known or Suspected - If misuse of equipment, or other improper procedures or behavior are identifiable, or suspected, then code this box, even if equipment fault is also present.

AD-A071 397 WYLE LABS HUNTSVILLE ALA F/G 13/10
RECREATIONAL BOATING SAFETY EDUCATION METHODOLOGY (RBSEM).(U)
APR 79 E SAGER, K GEISSLER, K REDICK, S COHEN DOT-CG-73433-A
UNCLASSIFIED MSR-79-01 USCG-D-37-79 NL

2 OF 4
AD
A071397

355 Shipboard Appliances - Includes any appliances not directly part of the boat's operational gear, such as stoves, refrigerators, heaters, lamps, lanterns, etc.; and/or fuel escaping from the appliances.

356 Electrical - Those appliances which are powered by electricity.

357 Equipment Fault Known or Suspected - Equipment malfunction or failure, or improper equipment are identifiable or suggested by the evidence. If improper procedures or behavior on the part of the operator or another person were also known or suspected to have occurred, then code box 11.

358 Behavior Fault Known or Suspected - If misuse of equipment, or other improper procedures or behavior are identifiable, or suspected, then code this box, even if equipment fault is also present.

359 Other than Electrical - Those appliances which are powered by other than electrical means, such as propane or other liquefied petroleum gases, kerosene, or alcohol.

360 Equipment Fault Known or Suspected - Equipment malfunction or failure, or improper equipment are identifiable or suggested by the evidence. If improper procedures or behavior on the part of the operator or another person were also known or suspected to have occurred, then code box 14.

361 Behavior Fault Known or Suspected - If misuse of equipment, or other improper procedures or behavior are identifiable, or suspected, then code this box, even if equipment fault is also present.

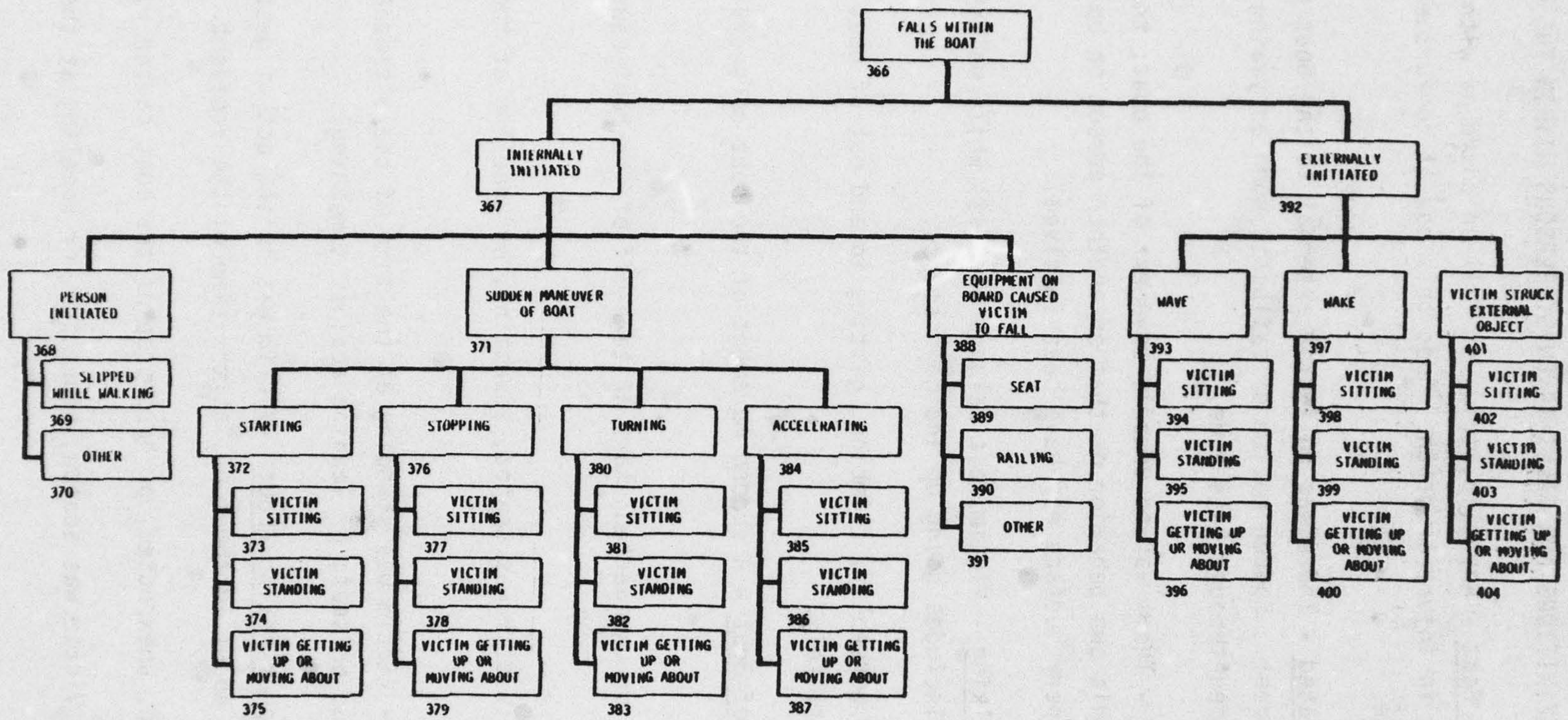
362 Originated Outside of this Boat - Contact with, or heat from, an outside source, such as another burning boat, set this boat on fire or caused an explosion. However, if heat from the sun caused an explosion of flammables/explosives, code the accident through node 5.

363 Other - A specific cause can be identified which is not included in the choices given in this tree.

APPENDIX A-11. (concluded)

364 Equipment Fault Known or Suspected - Equipment malfunction or failure, or improper equipment are identifiable or suggested by the evidence. If improper procedures or behavior on the part of the operator or another person were also known or suspected to have occurred, code box 18.

365 Behavior Fault Known or Suspected - If misuse of equipment, or other improper procedures or behavior are identifiable, or suspected, then code this box, even if equipment fault is also present.



APPENDIX A-12. FALLS TAKEN BY PERSONS WITHIN THE BOAT

APPENDIX A-13. DEFINITIONS FOR FALLS TAKEN BY PERSONS WITHIN THE BOAT

366 Falls Within the Boat - Any slip, trip, or fall on board or within the vessel resulting in injury or death. Code this box if no further information is available.

367 Internally Initiated - There was no factor external to the boat directly causing the accident. Sudden motion of sailboats such as yawing and broaching are coded through this node.

368 Person Initiated - There was no unusual movement of the boat; the victim fell because of his own behavior or that of another person on board (although a slippery surface may have been involved).

369 Slipped While Walking - Victim lost balance and fell while walking about the boat (includes going up and down steps).

370 Other - Includes horseplay, climbing, getting in and out of boat, or sitting inappropriately.

371 Sudden Maneuver of Boat - A sudden movement of the boat caused victim to fall.

372 Starting - Quick or unexpected start or take-off of the boat caused victim to fall.

373 Victim Sitting - Victim was seated, squatting, or kneeling at the time of the accident.

374 Victim Standing - Victim was standing at the time of the accident (includes having one foot up on seat; or leaning against something).

375 Victim Getting Up or Moving About - Victim was in the act of getting up, or he was moving about in the boat, at the time of the accident.

376 Stopping - Sudden, unexpected, or hard stop of the boat caused victim to fall.

377 Victim Sitting - Victim was seated, squatting, or kneeling at the time of the accident.

378 Victim Standing - Victim was standing at the time of the accident (includes having one foot up on seat, or leaning against something).

379 Victim Getting Up or Moving About - Victim was in the act of getting up, or he was moving about in the boat, at the time of the accident.

380 Turning - Sudden, unexpected, or sharp turn of the boat caused victim to fall. Includes yawing and broaching of sailboats.

381 Victim Sitting - Victim was seated, squatting, or kneeling at the time of the accident.

382 Victim Standing - Victim was standing at the time of the accident (includes having one foot up on seat; or leaning against something).

383 Victim Getting Up or Moving About - Victim was in the act of getting up, or he was moving about in the boat, at the time of the accident.

384 Accelerating - Sudden, unexpected, or quick acceleration caused victim to fall.

385 Victim Sitting - Victim was seated, squatting, or kneeling at the time of the accident.

386 Victim Standing - Victimg was standing at the time of the accident (includes having one foot up on seat; or leaning against something).

387 Victim Getting Up or Moving About - Victim was in the act of getting up, or he was moving about in the boat. at the time of the accident.

388 Equipment On Board Caused Victim to Fall - Equipment or cargo on board broke or fell, causing victim to fall.

389 Seat - Seat broke, causing victim to fall.

390 Railing - Railing broke, causing victim to fall.

391 Other - Other equipment on board broke or fell on victim, causing him to fall.

APPENDIX A-13. (concluded)

392 Externally Initiated - Some factor outside the boat caused victim to fall (either directly, or by causing something or someone on board to shift, knocking him down).

393 Wave - A wave or swell hit the boat causing victim to fall.

394 Victim Sitting - Victim was seated, squatting, or kneeling at the time of the accident.

395 Victim Standing - Victim was standing at the time of the accident (includes having one foot up on seat; or leaning against something).

396 Victim Getting Up or Moving About - Victim was in the act of getting up, or he was moving about in the boat, at the time of the accident.

397 Wake - Wake of own boat or other boat hit this boat, causing victim to fall.

398 Victim Sitting - Victim was seated, squatting, or kneeling at the time of the accident.

399 Victim Standing - Victim was standing at the time of the accident (includes having one foot up on seat; or leaning against something).

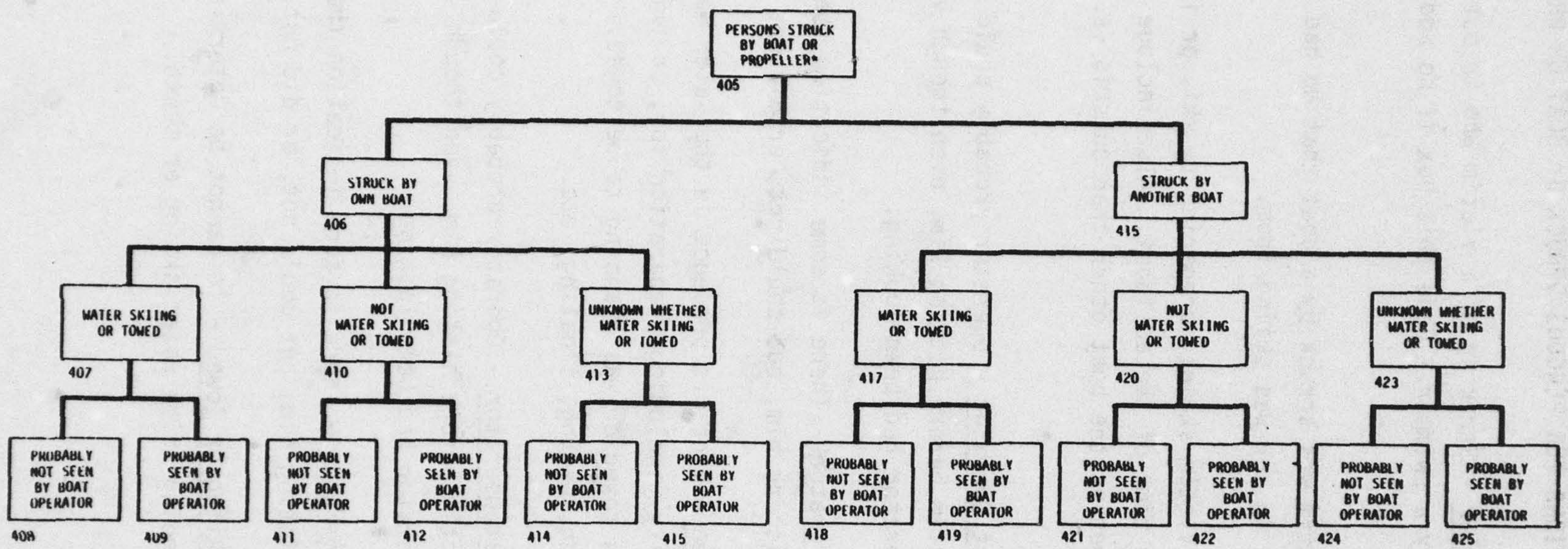
400 Victim Getting Up or Moving About - Victim was in the act of getting up, or he was moving about in the boat, at the time of the accident.

401 Victim Struck External Object - The victim fell because he impacted some object external to the boat, such as a bridge, tree limb, etc.

402 Victim Sitting - Victim seated, squatting, or kneeling at the time of the accident.

403 Victim Standing - Victim was standing at the time of the accident (includes having one foot up on seat; or leaning against something).

404 Victim Getting Up or Moving About - Victim was in the act of getting up, or he was moving about in the boat, at the time of the accident.



*ALL BLOCKS REFER TO THE STATUS OR ACTIVITY OF THE VICTIM

APPENDIX A-14. PERSONS STRUCK BY BOAT OR PROPELLER

APPENDIX A-15. DEFINITIONS FOR PERSONS STRUCK BY BOAT OR PROPELLER

405 Struck by Boat or Propeller - Striking of a victim who is outside of the boat, but not necessarily a swimmer. Code this box if no additional information is known.

406 Struck by Own Boat - Victim was struck by a boat that he had been riding in, was planning to ride in, or was skiing from.

407 Water Skiing or Towed - Victim skiing, preparing to ski, or in the water just after skiing at the time of the accident. Also include cases where the victim was being towed behind the boat other than on skis (e.g., on a raft or inner tube).

408 Probably Not Seen by Boat Operator - Operator probably could not, or states that he did not, see victim before hitting him, even though victim might have been visible if operator had been looking.

409 Probably Seen by Boat Operator - There is some indication that the operator saw the victim before hitting him, but could not, or did not avoid him.

410 Not Water Skiing or Towed - Victim's presence in the water was not related to his own skiing activity (including preparation for, or immediately after skiing); nor had he been towed or was planning to be towed. This category includes swimming, diving, wading, floating, etc.

411 Probably Not Seen by Boat Operator - Operator probably could not, or states that he did not, see victim before hitting him, even though victim might have been visible if operator had been looking.

412 Probably Seen by Boat Operator - There is some indication that the operator saw the victim before hitting him, but could not, or did not, avoid him.

413 Unknown Whether Water Skiing or Towed - It cannot be determined whether the victim had been or was going to be water skiing or towed.

414 Probably Not Seen by Boat Operator - Operator probably could not, or states that he did not, see victim before hitting him, even though victim might have been visible if operator had been looking.

415 Probably Seen by Boat Operator - There is some indication that the operator saw the victim before hitting him, but could not, or did not, avoid him.

416 Struck by Another Boat - Victim was struck by a boat that he had not been riding in or was not planning to ride in, and was not skiing/towed from. If victim had been riding in or was planning to ride in the boat, but was skiing from or towed by another boat at the time this boat hit him, code this box.

417 Water Skiing or Towed - Victim skiing, preparing to ski, or in the water just after skiing, at the time of the accident. Also includes cases where the victim was being towed behind the boat other than on skis (e.g., on a raft or inner tube).

418 Probably Not Seen by Boat Operator - Operator could not, or states that he did not see victim before hitting him, even if victim might have been visible if operator had been looking.

419 Probably Seen by Boat Operator - There is some indication that the operator saw the victim before hitting him, but could not, or did not, avoid him.

420 Not Water Skiing or Towed - Victim's presence in the water was not related to his own skiing activity (including preparation for, or immedately after skiing); nor had he been towed or was planning to be towed. This category includes swimming, diving, wading, floating, etc.

421 Probably Not Seen by Boat Operator - Operator could not, or states that he did not, see victim before hitting him, even if victim might have been visible if operator had been looking.

422 Probably Seen by Boat Operator - There is some indication that the operator saw the victim before hitting him, but could not, or did not, avoid him.

APPENDIX A-15. (concluded)

423 Unknown Whether Water Skiing/Towed - It cannot be determined whether the victim had been or was going to be water skiing or towed.

424 Probably Not Seen by Boat Operator - Operator probably could not, or states that he did not, see victim before hitting him, even though victim might have been visible if operator had been looking.

425 Probably Seen by Boat Operator - There is some indication that the operator saw the victim before hitting him, but could not, or did not, avoid him.

APPENDIX B. INSTRUCTIONS FOR VALIDATING NEW CAUSE IDENTIFICATION MODELS FOR RBSEM

INTRODUCTION

Please be certain you understand these coding instructions fully before you begin the task. You are being asked to code these accidents, so that we may determine the adequacy of the new cause identification models for four types of recreational boating accidents:

- fires and/or explosions of fuel on the boat
- fires and/or explosions on the boat other than fuel
- falls taken by persons within the boat
- injuries or fatalities resulting from persons being struck by a boat or by a propeller.

In fact, this is a trial run on use of the cause identification models. These models have been developed for RBSEM-recreational boating safety education methodology. They are intended to help the Coast Guard identify accident causes responsible for high frequencies of accidents, fatalities, injuries, and/or property damage. Your input will result in either changes to the models or delivery of the models as they are to the Coast Guard. The possible changes to be considered include definitions, wordings, or the actual structure of the tree or model itself. So, you are asked to make note of all problems you have while coding, and report suggestions and complaints. Please make these communications verbally to K. Geissler or E. Sager or write them down.

It is important to identify weaknesses in the models at this early stage, so that time and effort will not be spent coding accidents through them, and then having to recode them later. So keep a critical frame of mind!

Here is how you should proceed with the first part of the tasks (action (1)).

ACTION (1): CAUSE CODES

Put your name in the blank by "Coder" on the worksheet for Cause Identification Coding. Take one of the BARs you have been given and record the accident report serial number in the left hand column. This number appears on the first page of the BAR in bold black "felt pen" writing (ARM or PRAM) or in red pencil. Determine which of the four accident types this BAR falls in. Each BAR should fall in

one of the categories. If you feel that any single BAR does not fit into these categories, please note this on your worksheet.

For "falls within the boat" and "hit by boat or propeller," code each victim separately. This is, if BAR #778253 reports an accident in which two swimmers were hit by a boat, then code each victim once, numbering them consecutively: 778253(1) and 778253(2). For fire/explosion accidents, code each boat once, regardless of the number of victims on board.

In cases where an accident is the result of a chain of accident events, it should be coded according to the primary (first) accident that occurs. For example, if the boat operator falls down within the boat, causing the boat to go out of control, resulting in a collision; that BAR is coded as "falls within the boat."

When you have chosen the accident category, take the appropriate cause identification tree or model for that accident type and code the accident as far through the tree as you can from the available information. Be sure to first read the specific instructions that go with the model. Again, if you have criticisms and/or suggestions concerning the models, please note them!

Now you are ready for the second task (action (2)).

ACTION (2): OPERATOR ALTERNATIVES

When you have recorded the proper code for the accident cause according to the model, take the "Worksheet for Determining Operator Alternatives for Educational Objectives" for the category to which you have assigned that accident. Put your name in the "Coder" blank. Then, from the information available on the BAR, we would like you to determine exactly what the operator of the boat involved in the accident could have done to avoid the accident, and/or to reduce the severity of the consequences after the accident has occurred: what he should have done or what he should have known. This may include alternative behavior for persons on board other than the operator. The alternative action or decision which you offer should be plausible and consistent with the conditions in which the accident occurred. You will likely find a great many duplications in your judgments, over all of the accidents, since you have already grouped these accidents according to accident type and accident cause. If you cannot decide on a realistic alternative action or

decision, go on to the next accident report. The alternatives should be readily available if enough information is given in the accident report. If the operator behaved appropriately, but was not successful in avoiding the accident, go ahead and list that behavior as an alternative. You may include more than one alternative if they are readily apparent. The alternatives may fall into the following categories:

- pre-accident behavior or avoidance of conditions in which such accidents tend to occur (e.g., "maintain the boat and its equipment in good condition by regular servicing")
- How to handle the operation of the boat in such a way that the accident does not occur (e.g., "don't smoke while fueling")
- How to stabilize the crisis after the accident has occurred (e.g., "use fire extinguishers right away")
- How to prevent fatalities after the accident has occurred (e.g., "non-swimmers should wear PFDs").

Jot down your alternative(s) for the operator on the worksheets provided. Please indicate the serial number for the accident report in the column to the right, and double check to be sure you are recording the information on the right worksheet, for that particular accident type and cause.

Please continue with the remaining BARs in the same manner.

ACTION 1:
WORKSHEET FOR CAUSE IDENTIFICATION
CODING FOR VALIDATING NEW MODELS FOR RBSEM

CODER: ____________________

ACCIDENT TYPE: ______________

BAR Serial Number	Cause Identification Code from Model	Comments on Use of the Model (Identify Relevant Accident Serial Nos.)

ACTION 2:
WORKSHEET FOR DETERMINING OPERATOR
ALTERNATIVES FOR EDUCATIONAL OBJECTIVES

CODER: ______________________

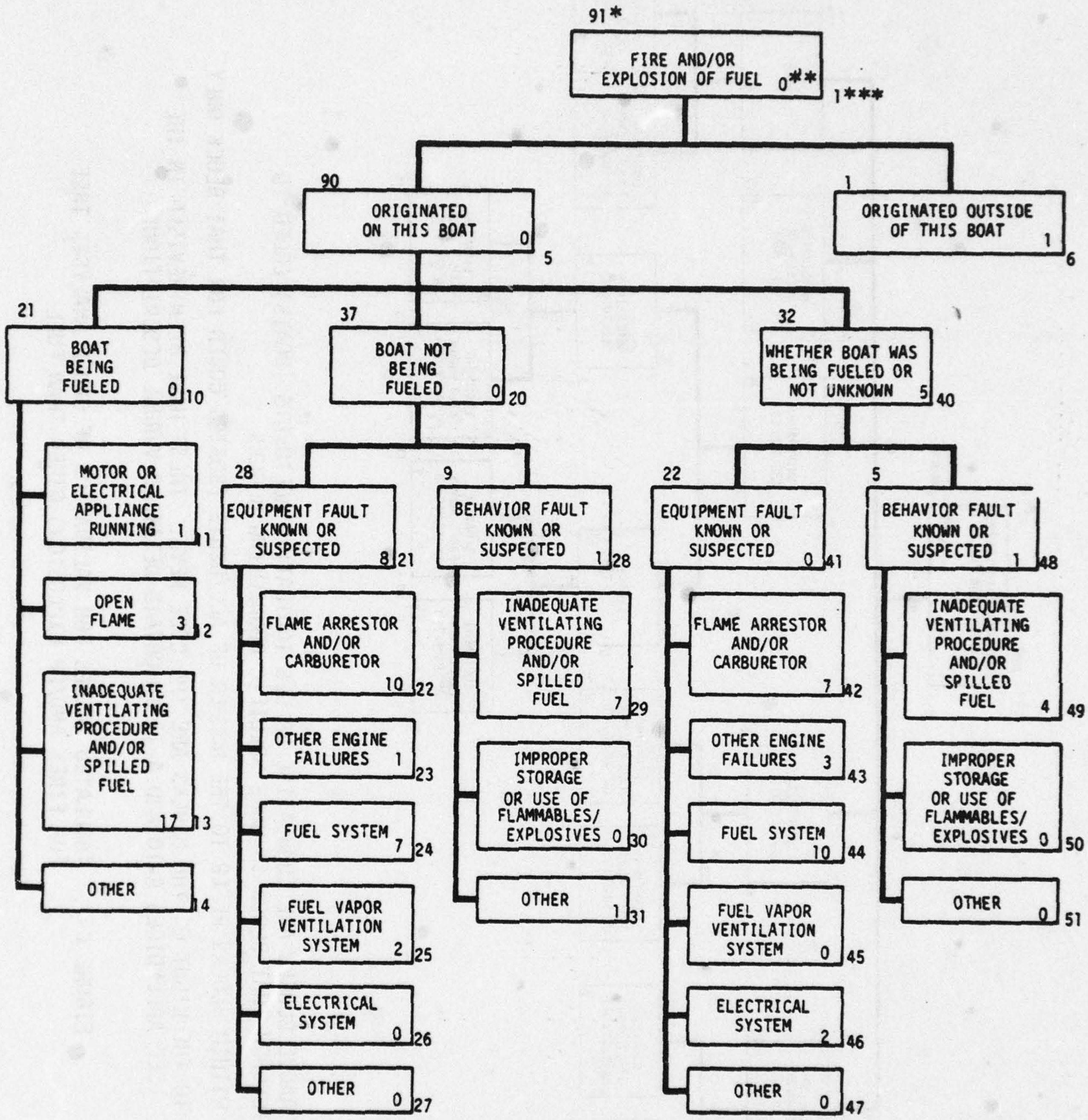
ACCIDENT TYPE: ______________

CAUSE OR CODING CATEGORY:

For duplications, list all serial numbers for which the operator alternative is appropriate, and use tally marks (~~||||~~) in the operator alternative column.

OPERATOR ALTERNATIVE ACTIONS AND DECISIONS	ACCIDENT SERIAL NUMBER

APPENDIX C. RESULTS OF VALIDATION OF NEW CAUSE ANALYSIS MODELS

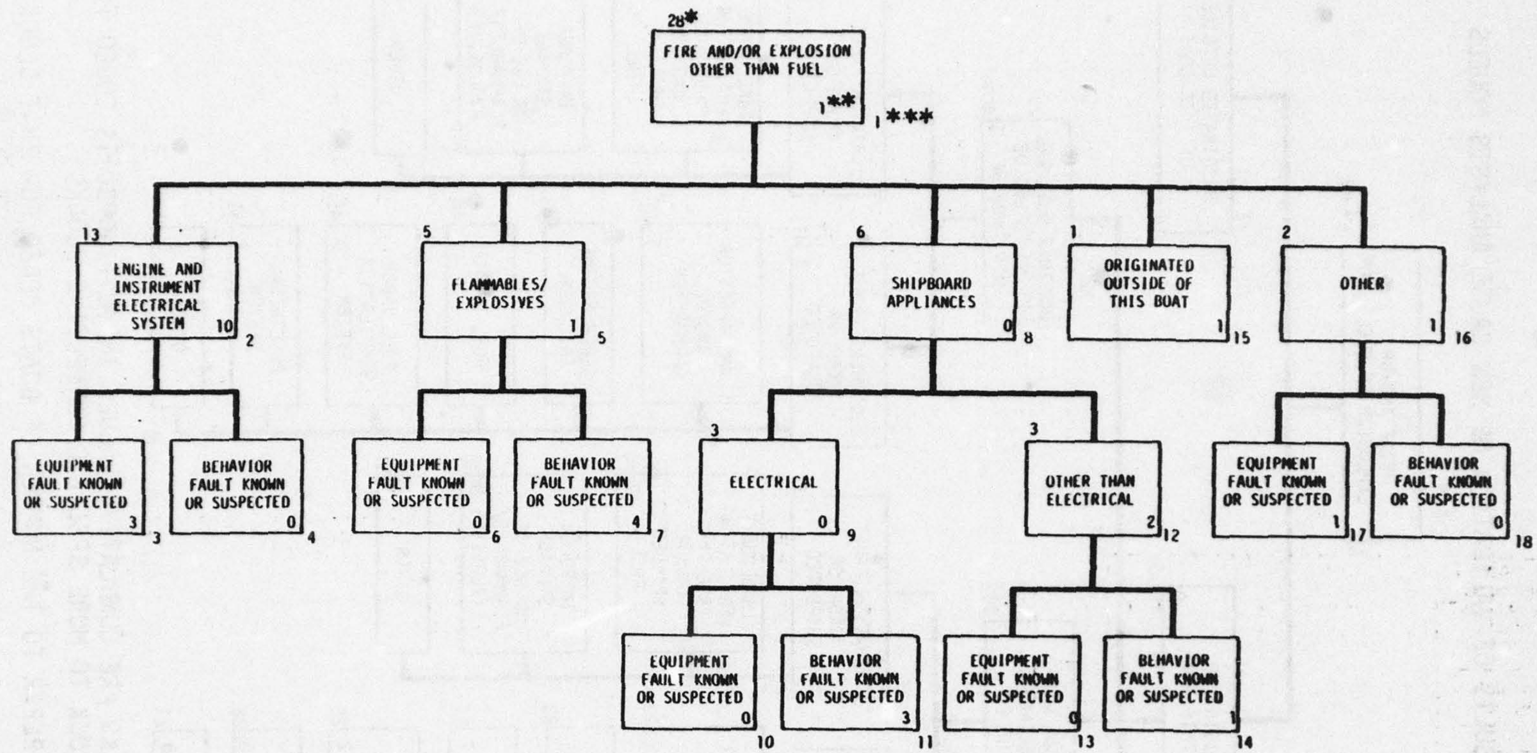


* NUMBERS ABOVE THE BLOCKS ARE CUMULATIVE VALUES INDICATING BOATS CODED TO AND/OR THROUGH THAT BLOCK TO MORE SPECIFIC CONNECTING BLOCKS

** NUMBERS WITHIN BLOCKS REFER TO THE NUMBER OF BOATS CODED FOR THAT BLOCK ONLY

***NUMBERS TO THE RIGHT OF THE BLOCKS ARE THE CODE KEYS. THESE HAVE BEEN REVISED IN THE INTERIM. SEE APPENDICES A-7 AND A-9 TO OBTAIN DETAILED VERBAL DESCRIPTIONS.

FIGURE C-1. TABULATED VALUES FOR VALIDATION OF CAUSE ANALYSIS TREE FOR FIRES AND/OR EXPLOSIONS OF FUEL

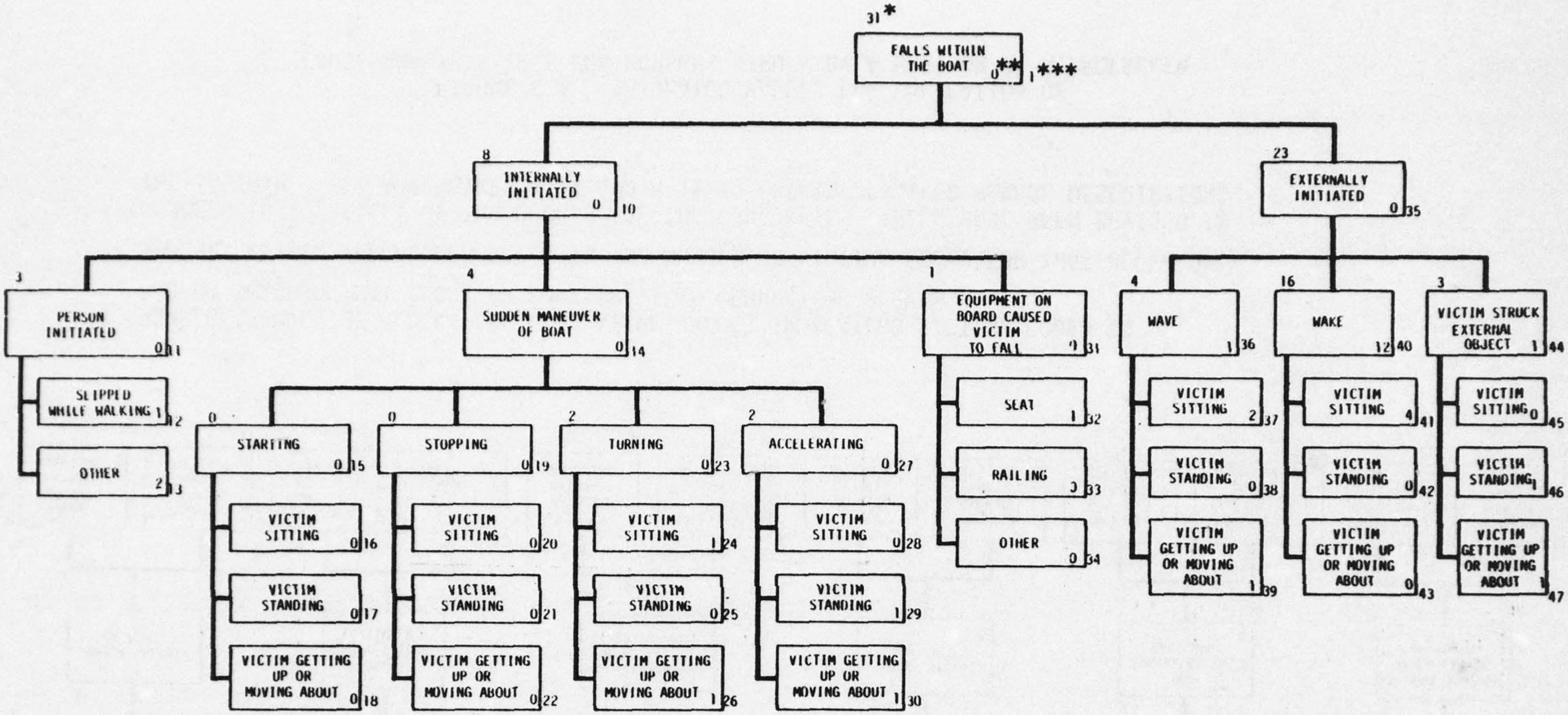


* NUMBERS ABOVE BLOCKS ARE CUMULATIVE VALUES INDICATING ACCIDENTS (BOATS) CODED TO AND/OR THROUGH THAT BLOCK TO MORE SPECIFIC CONNECTING BLOCKS

** NUMBERS WITHIN BLOCKS REFER TO THE NUMBER OF ACCIDENTS (BOATS) CODED FOR THAT BLOCK ONLY

***NUMBERS TO THE RIGHT OF THE BLOCKS ARE THE CODE KEYS. THESE HAVE BEEN REVISED IN THE INTERIM. SEE APPENDICES A-10 AND A-11 TO OBTAIN DETAILED VERBAL DESCRIPTIONS.

FIGURE C-2. TABULATED VALUES FOR VALIDATION OF CAUSE ANALYSIS TREE FOR FIRES AND/OR EXPLOSIONS OTHER THAN FUEL

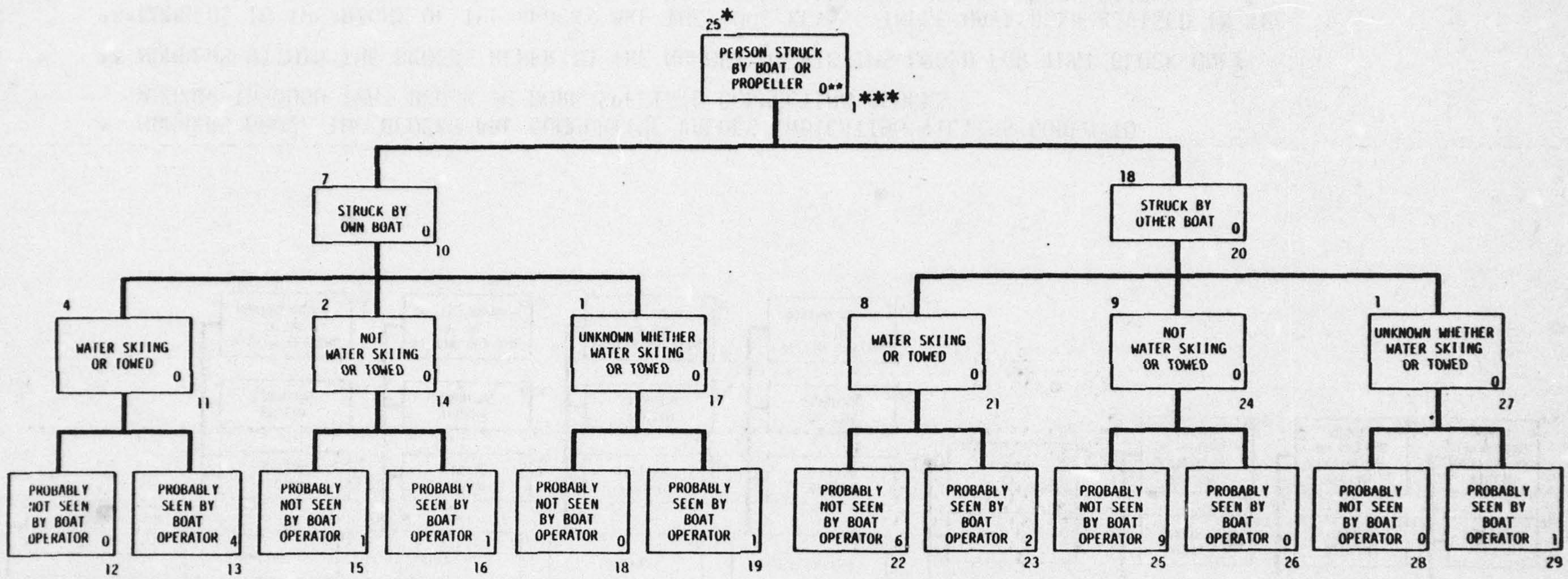


* NUMBERS ABOVE THE BLOCKS ARE CUMULATIVE VALUES INDICATING VICTIMS CODED TO AND/OR THROUGH THAT BLOCK TO MORE SPECIFIC CONNECTING BLOCKS

** NUMBERS WITHIN THE BLOCKS REFER TO THE NUMBER OF VICTIMS CODED FOR THAT BLOCK ONLY

***NUMBERS TO THE RIGHT OF THE BLOCKS ARE THE CODE KEYS. THESE HAVE BEEN REVISED IN THE INTERIM. SEE APPENDICES A-12 AND A-13 TO OBTAIN DETAILED VERBAL DESCRIPTIONS.

FIGURE C-3. TABULATED VALUES FOR VALIDATION OF CAUSE ANALYSIS TREE FOR FALLS TAKEN BY PERSONS WITHIN THE BOAT



* NUMBERS ABOVE THE BLOCKS ARE CUMULATIVE VALUES INDICATING VICTIMS CODED TO AND/OR THROUGH THAT BLOCK TO MORE SPECIFIC CONNECTING BLOCKS

** NUMBERS WITHIN THE BLOCKS REFER TO THE NUMBER OF VICTIMS CODED FOR THAT BLOCK ONLY

*** NUMBERS TO THE RIGHT OF THE BLOCKS ARE THE CODE KEYS. THESE HAVE BEEN REVISED IN THE INTERIM. SEE APPENDICES A-14 AND A-15 TO OBTAIN DETAILED VERBAL DESCRIPTIONS.

FIGURE C-4. TABULATED VALUES FOR VALIDATION OF CAUSE ANALYSIS TREE FOR PERSONS STRUCK BY A BOAT OR BY A PROPELLER

APPENDIX D. OPERATOR ALTERNATIVES AND NUMERIC CODES

APPENDIX D-1. OPERATOR ALTERNATIVES FOR COLLISION ACCIDENTS, AND NUMERIC CODES

Code	Operator Alternatives (All Collisions)
101	maintain attention to operation of boat
102	maintain proper look out
103	avoid excessive or inappropriate speed
104	know and obey "rules of the road"
105	allow for safe distances between boats
106	know navigation light configurations for recognition of other boats
107	use navigation lights on own boat
108	be familiar with own boat's handling characteristics
109	maintain clear visibility from helm station
110	know position of own boat or stop if in doubt
111	turn off motor periodically and listen for other boats during low visibility conditions
112	be familiar with area of boating activity
113	have boat under control
114	avoid reckless operation of boat
115	keep boat in safe operating condition
116	use horn or bell in traffic when appropriate
117	approach and depart from harbors with extreme caution
118	drop anchor if drifting and/or in doubt of boat's position
119	allow eyes to adjust to low light levels (dark adaptation)
120	avoid boat operation when using alcohol
121	avoid boat operation when fatigued

OPERATOR ALTERNATIVES FOR COLLISION ACCIDENTS, AND NUMERIC CODES (concluded)

Code	Operator Alternatives (All Collisions)
122	have PFDs accessible for all POB*
123	wear PFD if nonswimmer, young child, or elderly*
999	other (please specify) ______________________.

* Operator alternatives which serve to reduce the likelihood of injuries or fatalities for victims as a consequence of the accident.

APPENDIX D-2. OPERATOR ALTERNATIVES FOR CAPSIZINGS, AND NUMERIC CODES

Code	Operator Alternatives (Capsizings Initiated by Load Shifts)
201	move about the boat with care to maintain trim
202	maintain an even load distribution in boat
203	do not drop two anchors from the same side of a small boat
204	cut anchor line to right a capsizing boat
205	use a net or pole to retrieve objects from water
206	avoid sudden maneuvers with the boat
207	avoid overloading the boat with gear or people
208	drop anchor prior to complete loss of power to avoid drifting into turbulent water
209	avoid standing while fishing from a small boat
210	tow a disabled boat slowly and avoid sharp maneuvers
211	keep body as close as possible to longitudinal center of boat or canoe
212	avoid rapids without proper instruction and/or other advance preparation
213	use USCG approved PFDs*
214	wear PFD if nonswimmer, young child, or elderly*
215	wear properly fitting PFD*
216	remain with the capsized boat*
217	exercise caution when retrieving anchor
218	have PFDs accessible for all persons on board*

OPERATOR ALTERNATIVES FOR CAPSIZINGS, AND NUMERIC CODES (continued)

Code	Operator Alternatives (Capsizings Initiated by Waves)
219	quarter the bow of the boat into oncoming wave(s)
220	regulate speed and power according to wave conditions
221	remain alert to identifying turbulent, rough water
222	keep bow of boat positioned to avoid exposing a surface to direct force of wind and waves
223	remain alert to waves approaching from the beam
224	stay clear of heavy surf
225	drop anchor to avoid drifting into surf or other turbulent water
226	avoid overloading the boat with gear or people
227	launch boat at a calm water site
228	avoid close proximity to dam site currents
229	remain alert for waves approaching from the stern
230	keep the boat trimmed and balanced
231	avoid turning the stern into large waves
232	wear PFD if nonswimmer, young child, or elderly*
233	remain with capsized boat*
234	have PFDs accessible for all persons on board*

OPERATOR ALTERNATIVES FOR CAPSIZINGS, AND NUMERIC CODES (continued)

Code	Operator Alternatives (Capsizings Initiated by Wakes)
235	keep the boat trimmed and balanced
236	quarter the bow of the boat into oncoming wake
237	avoid overloading the boat with gear or people
238	avoid turning the stern into a large wake
239	avoid close proximity to large wakes
240	wear PFD if nonswimmer, young child, or elderly*
241	have PFDs accessible for all persons on board*
242	remain with the capsized boat*

OPERATOR ALTERNATIVES FOR CAPSIZINGS, AND NUMERIC CODES (concluded)

Code	Operator Alternatives (Capsizings Initiated by Sudden Maneuvers)
243	be familiar with own boat's handling characteristics
244	don't exceed manufacturer's recommended power when selecting boat engine
245	exercise care during sudden acceleration of boat
246	avoid excessive acceleration when making a sharp turn
247	exercise care during sudden deceleration
248	exercise care during turns at high speeds
249	exercise care during sharp turns
250	avoid overloading boat with gear or people
251	maintain an even load distribution in boat
252	move about the boat with care to maintain trim
253	operate boat within envelope of safe performance and handling characteristics
254	have PFDs accessible for all persons on board*
255	wear PFD if nonswimmer, young child, or elderly*
256	attend to survival and rescue of person first (following an accident), and recover material belongings after human safety is assured*
999	other (please specify) ________________________________.

APPENDIX D-3. OPERATOR ALTERNATIVES FOR SWAMPINGS/FLOODINGS, AND SINKINGS, AND NUMERIC CODES

Code	Operator Alternatives (Swampings/Floodings, and Sinkings Initiated by Load Shifts)
257	plan ahead for maintaining an even load distribution in the boat
258	move about the boat with care to maintain trim
259	exercise caution when retrieving anchor
260	maintain an even load distribution in the boat
261	keep control of pets on the boat
262	avoid overloading the boat with gear or people
263	avoid standing in a small boat
264	know the operating limits of the boat and avoid water conditions that exceed those limits
265	keep passengers calm and seated during adverse conditions
266	exercise caution when dropping anchor
267	wear PFD if nonswimmer, young child, or elderly*
268	have PFDs accessible for all persons on board*
269	remain with the swamped/capsized boat (if floating)*

OPERATOR ALTERNATIVES FOR SWAMPINGS/FLOODINGS, AND SINKINGS; AND NUMERIC CODES (continued)

Code	Operator Alternatives (Swampings/Floodings, and Sinkings Initiated by Waves)
270	avoid overloading the boat with gear or people
271	maintain an even load distribution in the boat
272	be aware of small craft advisories and heed them
273	avoid anchoring boat where water may become turbulent
274	be familiar with area of boating activity
275	remain alert for identifying early signs of adverse water or weather conditions
276	keep passengers calm and seated during adverse conditions
277	launch boat at a calm water site
278	exercise caution under strong wind and water conditions
279	know how to land and tie up the boat
280	tie off or anchor boat so the bow is toward oncoming waves
281	know the operating limits of the boat and avoid water conditions that exceed those limits
282	avoid rapids in the boat unless proper instruction has been given, or other advance preparation has been made
283	know how to handle the boat under adverse water conditions
284	quarter the bow of the boat into oncoming wave(s)
285	regulate speed and power according to wave conditions
286	stay close to shore in johnboats
287	remain alert for deterioration of weather conditions
288	avoid anchoring the boat by the stern
289	exercise caution in areas of high tidal fluctuations
290	know operating range for fuel use, and monitor fuel consumption during the outing

OPERATOR ALTERNATIVES FOR SWAMPINGS/FLOODINGS,
AND SINKINGS; AND NUMERIC CODES (continued)

Code	Operator Alternatives (Swampings/Floodings, and Sinkings Initiated by Waves (concluded))
291	utilize full capabilities of fuel tank system to avoid loss of engine during adverse weather/water conditions
292	remain with the swamped/capsized boat (if floating)*
293	have PFDs accessible for all persons on board*
294	wear PFD if nonswimmer, young child, or elderly*

OPERATOR ALTERNATIVES FOR SWAMPINGS/FLOODINGS, AND SINKINGS; AND NUMERIC CODES (continued)

Code	Operator Alternatives (Swampings/Floodings, and Sinkings Initiated by Wakes)
295	avoid boat operation when using alcohol
296	avoid overloading the boat with gear or people
297	exercise caution when crossing wakes
298	tie off or anchor boat so the bow is toward oncoming wakes
299	maintain an even load distribution in the boat
300	keep passengers calm and seated during adverse conditions
301	back down slowly and cautiously in a low transom boat
302	decelerate slowly in a following sea
303	be aware of small craft advisories and heed them
304	wear PFD if nonswimmer, young child, or elderly*
305	have PFDs accessible for all persons on board*
306	remain with the swamped/capsized boat (if floating)*

OPERATOR ALTERNATIVES FOR SWAMPINGS/FLOODINGS, AND SINKINGS; AND NUMERIC CODES (concluded)

Code	Operator Alternatives (Swampings/Floodings, and Sinkings Initiated by Sudden Maneuvers)
307	be familiar with own boat's handling characteristics
308	don't exceed manufacturer's recommended power when selecting boat engine
309	be familiar with own boat's engine and steering controls
310	exercise care during sudden acceleration of boat
311	avoid excessive acceleration when making a sharp turn
312	exercise care during sudden deceleration
313	exercise care during turns at high speed
314	exercise care during sharp turns
315	exercise care when turning into wake of own boat or other boat
316	avoid overloading the boat with gear or people
317	maintain an even load distribution in boat
318	avoid excessive or inappropriate speed
319	avoid close proximity to dam site currents
320	avoid boat operation when using alcohol
321	operate boat within envelope of safe performance and handling characteristics
322	have PFDs accessible for all persons on board*
323	wear PFD if nonswimmer, young child, or elderly*
324	attend to survival and rescue of persons first (following an accident),* and recover material belongings after human safety is assured
325	wear PFD when special conditions warrant caution*
999	other (please specify) ________________________________.

APPENDIX D-4. OPERATOR ALTERNATIVES FOR FALLS OVERBOARD, AND NUMERIC CODES

Code	Operator Alternatives (Falls Overboard Initiated by Load Shifts)
401	always stop the boat before leaving the helm
402	move about the boat with care
403	wear PFD if nonswimmer, young child, or elderly
404	keep persons on board from leaning over gunwales or transom while boat is underway
405	avoid sitting on foredeck of the boat if it is not equipped with handrails
406	use a "buddy system" or a safety rope when leaning over gunwales or transom (to inspect motor, etc.)
407	wear PFD when leaning over gunwales or transom (to inspect motor, etc.)*
408	avoid standing in a small boat
409	know the operating limits of the boat and avoid water conditions that exceed those limits
410	move about the boat with care to maintain trim
411	avoid standing while fishing from a small boat
412	exercise caution when retrieving anchor
413	keep body as close as possible to longitudinal center of narrow boat or canoe
414	throw PFD to person overboard immediately after fall from boat*

OPERATOR ALTERNATIVES FOR FALLS OVERBOARD, AND NUMERIC CODES (continued)

Code	Operator Alternatives (Falls Overboard Initiated by Waves)
415	know the operating condition of the boat and related equipment
416	avoid operation of the boat in turbulent water unless the boat is in 100% operational condition
417	quarter the bow of the boat into oncoming waves
418	wear PFD if nonswimmer, young child, or elderly*
419	throw PFD to person overboard immediately after fall from boat*

OPERATOR ALTERNATIVES FOR FALLS OVERBOARD, AND NUMERIC CODES (continued)

Code	Operator Alternatives (Falls Overboard Initiated by Wakes)
420	avoid sitting on foredeck of the boat if it is not equipped with handrails
421	move about the boat with care
422	wear PFD if nonswimmer, young child, or elderly*
423	exercise caution when retrieving anchor
424	avoid standing in a small boat
425	quarter the bow of the boat into oncoming wake
426	throw PFD to person overboard immediately after fall from boat*

OPERATOR ALTERNATIVES FOR FALLS OVERBOARD, AND NUMERIC CODES (concluded)

Code	Operator Alternatives (Falls Overboard Initiated by Sudden Maneuver)
427	be familiar with own boat's engine and steering controls
428	don't exceed manufacturer's recommended power when selecting boat engine
429	exercise care during turns at high speeds
430	exercise care when turning into wake of own boat or other boat
431	avoid sudden maneuvers if persons on board are not securely seated
432	avoid overloading the boat with gear or people
433	avoid sitting on foredeck of boat if it is not equipped with handrails
434	wear PFD when special conditions warrant caution*
435	attend to survival and rescue of persons first (following an accident), and recover material belongings after human safety is assured*
436	wear PFD if nonswimmer, young child, or elderly*
999	other (please specify) ______________________.

APPENDIX D-5. OPERATOR ALTERNATIVES FOR FIRES AND/OR EXPLOSIONS OF FUEL, AND NUMERIC CODES

Code	Operator Alternatives (Fires and/or Explosions of Fuel)
501	close all hatches and openings to cabin or below deck spaces before fueling
502	secure all pilot lights and/or other open flames before fueling
503	ventilate cabin and engine spaces thoroughly after fueling
504	ventilate engine spaces thoroughly before starting engine
505	have adequate fire prevention and extinguishing equipment on board and maintain in operational condition
506	know effective fire extinguishing technique, including proper use of all fire extinguishers on board
507	inspect and maintain fuel system to ensure against possible fuel leaks
508	use an effective flame arrestor and be certain that it is properly installed
509	use starting fluid with extreme caution
510	install factory recommended equipment and parts or completely suitable alternatives
511	wipe up and wash all spilled fuel from boat
512	maintain carburetor or injection system in good repair
513	use caution while making adjustments to running engine in order to minimize sparks or backfires
999	other (please specify) ________________________________.

APPENDIX D-6. OPERATOR ALTERNATIVES FOR FIRES AND/OR EXPLOSIONS OTHER THAN FUEL, AND NUMERIC CODES

Code	Operator Alternatives (Fires and/or Explosions Other Than Fuel)
601	keep mechanical equipment in safe operating condition
602	inspect fire extinguishing equipment regularly, and maintain in operating condition
603	know and observe recommended safety procedures for preventing fire or explosion during routine or emergency maintenance
604	secure and check all gas and electrical appliances including lanterns before leaving boat
605	exercise caution when lighting off any open flame applicances on board
606	maintain appliances and appliance fuel containers in good operating condition
607	keep spaces clear near open flame or heating appliances
999	other (please specify) ______________________________.

APPENDIX D-7. OPERATOR ALTERNATIVES FOR FALLS TAKEN BY PERSONS WITHIN THE BOAT, AND NUMERIC CODES

Code	Operator Alternatives (Falls Taken by Persons Within the Boat)
701	avoid physical horseplay on boat
702	keep persons on board informed of special requirements for remaining seated, holding on to rails, etc.
703	use secure handholds when moving about in boat
704	face toward dock or ladder while ascending or descending
705	avoid sudden acceleration or deceleration of boat without warning persons on board if they are standing or moving about
706	exercise caution when moving about the boat in strong wind and water conditions
707	remain alert to turbulent water conditions
708	maintain moderate speeds in areas of turbulent water
709	notify persons on board of passage under bridges, etc. having low clearance
710	keep emergency medical kit on board*
711	keep persons properly seated when operating boat at high speed
712	exercise caution when turning boat into waves or wakes
713	avoid operation of boat in surf without prior preparation for turbulence
714	maintain reasonable speeds when in traffic or when encountering wakes
715	have sturdy seating available for all persons on board
716	maintain seating and chairs in sturdy condition
717	avoid boating when using alcohol
718	use handholds when climbing in and out of boat
999	other (please specify) ______________________________.

APPENDIX D-8. OPERATOR ALTERNATIVES FOR PERSONS STRUCK BY BOAT OR PROPELLER, AND NUMERIC CODES

Code	Operator Alternatives (Persons Struck by Boat or Propeller)
801	stop propeller rotation when retrieving persons from water
802	approach persons in water for recovery into boat from downwind or use other suitable procedure
803	maintain attention to operation of boat
804	know where all persons in water are when operating boat near swimmers
805	avoid close proximity to other boats when towing skier(s) with own boat
806	be alert to signal other boat operators when they approach swimmers from the boat
807	maintain proper look out for swimmers when boating near shore or near other boats not underway
808	avoid boating in area where divers flag is displayed
809	avoid following skiers with a boat too closely
810	have observer in boat when towing a skier
811	exercise caution when operating boat near other boats towing skiers
999	other (please specify) ______________________________.

APPENDIX E. CODING INSTRUCTIONS FOR ASSOCIATED FACTORS

After an accident has been coded through the appropriate cause analysis tree, an additional task is to identify associated factors involved in the case. Associated factors are behaviors, conditions, or events that were present in the accident situation, and may be contributory to causing it or increasing its severity. Such factors may impair operator performance, interact with other aspects of hazardous situations, or may even play direct causal roles. Sometimes their presence must be inferred from other information given. For example, the computer printout or the BAR may indicate that a boat operator has been on an outing where he operated the boat without rest for more than five hours. In this case, you can infer that operator fatigue was an associated factor, although there may be no direct evidence that it caused the accident. In some instances you may not be able to identify any associated factors, while in others there may be several involved. Check as many as you feel played a contributory role. If you believe that an additional condition, behavior, or event which is not defined in the following list has played a contributory role in the accident, enter it into the blanks provided beside the category "Other."

- Operator Alcohol Consumption - The operator was known to have consumed alcoholic beverages from an autopsy, tests administered by investigating personnel, or by virtue of the testimony of witnesses.

- Operator Fatigue - The operator was exposed to four or more hours of sunshine and/or significant stressors (such as those listed below). The exposure may have been while boating or during another activity prior to operating the boat.

- Glare - This pertains to reflected sunlight, or any other light source off the surface of the water, or off something on the boat. It also refers to direct glare from the sun, or any other light source. Preliminary research suggests that exposure to glare can have cumulative effects.

- Excessive Shock/Vibration, Noise Levels - The operator was exposed to enough of one or more of these environmental influences that his performance in driving the boat is likely to have been affected. The

exposure may have been moderate for a prolonged period of time, or it may have been very high for a shorter period of time. A significant shock/vibration problem can be assumed to result from high speed operation in rough water. Again, preliminary research suggests that these environmental influences (stressors) can have cumulative effects.

- Operator Inattention - The operator simply did not see the other boat or object that he should have seen in time to avoid the accident. Usually, this operator problem will be indicated on the BAR.

- Excessive Speed for Conditions - The operator was travelling at a rate of speed greater than that which was warranted by water conditions, traffic, etc. Excessive speed is information often included in the comments on the BAR. Otherwise, when not specifically stated on the BAR, its association with the accident requires coder judgment.

- Reckless or Malicious Operation - The operator deliberately tried to place his boat in the collision situation (or other accident situation). It may have been because of a dislike for another person involved, or it may have been a careless, mischievous impulse. This information is usually indicated on the BAR.

APPENDIX F. TASK DESCRIPTIONS FOR U.S. COAST GUARD PERSONNEL TO IMPLEMENT RBSEM PHASE I

Construction of RBSEM Data Files

TASKS FOR EDUCATION ANALYST	TASKS FOR COMPUTER SUPPORT PERSONNEL	TASKS FOR CODER SUPPORT PERSONNEL
Determine desired year for education data base; this will be the year from which the sample of accidents will be taken	Initiate Phase "0" of computer software package; this procedure transfers the U. S. Coast Guard SPSS data from magnetic tape to disk	
Select the sample of accidents from the desired year	Initiate Phase "1" to perform the sampling operation; the subroutines utilized in this operation are interactive, and will require the active participation of the education analyst	
	Initiate Phase "2" to build the IS/ATHENA data base for the selected sample of accidents	
	Initiate Phase "3" to produce computer report page for each selected accident	
Retrieve and copy BARs, MIOs, and other related documents for each selected accident (use BAR numbers shown on computer report pages)		
Recruit coding support personnel and supply required coding materials: ● computer report pages ● BARs, MIOs, etc. ● Coding Instruction Booklet (App.J) ● Other materials needed for coding (Appendices A, D, E and K)		

Construction of RBSEM Data Files

TASKS FOR EDUCATION ANALYST	TASKS FOR COMPUTER SUPPORT PERSONNEL	TASKS FOR CODER SUPPORT PERSONNEL
Initiate coding operations; monitor coding operations; remain available for answering questions; check to see that sample composition remains as intended relative to group size and sample structure		Identify coder using personal initials in upper right-hand corner of computer report page Verify and complete information given on computer report page Trace each accident through appropriate cause analysis tree; record the selected cause directly on the computer report page Identify associated factors for each accident; record the selected associated factors directly on the computer report page Identify operator alternative behaviors or actions that might have avoided or reduced the severity of the accident; record the selected operator alternatives directly on the computer report page Write and edit descriptive scenario on edit sheets; copy edited version directly on the computer report page
	Update original IS/ATHENA data base with information identified by coders as in-error or incomplete (using an interactive terminal) Select keypunch operator(s), provide computer report pages and keypunch instructions	

Construction of RBSEM Data Files

TASKS FOR EDUCATION ANALYST	TASKS FOR COMPUTER SUPPORT PERSONNEL	TASKS FOR CODER SUPPORT PERSONNEL
	Oversee keypunch operation; verify the format for data on keypunch cards	
	Load keypunched data onto one disk file; load keypunched scenario on another disk file	
	Initiate Phase "4" to merge key-punched data on each accident with original data on file in IS/ATHENA; load new IS/ATHENA data base onto computer disk file	
	Initiate Phase "5" to write FILINFO from original SPSS system file onto disk file (FILINFO contains descriptive information for all original SPSS variables)	
	Add to FILINFO the descriptive information for new variables (i.e., initiators, alternatives, and associated factors) to create SPSSDIR; this is part of Phase "5." Note that Phase "5" does not have to be run each year unless the format of the original SPSS file changes. If it does not change, the file SPSSDIR originally created by Phase "5" may be reused	
	Initiate Phase "6" to load new SPSS data base with new sample data and SPSSDIR	

Identification of Accident Types, Initiators, and Associated Factors

TASKS FOR EDUCATION ANALYST	TASKS FOR COMPUTER SUPPORT PERSONNEL	TASKS FOR CODER SUPPORT PERSONNEL
	Initiate Phase "7" to produce second computer report page for each selected accident; second report includes all original information and coded information	
Determine source of information for selection of accident type, i.e., use of CG-357 or use of year-end data on file tape	If selection of accident type is from year-end data on file tape, initiate Phase "8" which is an SPSS BREAKDOWN of accident type and the five severity criteria (provide ranking data for the accident types)	
Rank accident types according to severity criteria and other specified considerations		
Identify the high priority types of accidents according to the rankings in previous operation		
Specify the high priority accident type(s) to computer support personnel to begin identification of accident initiators for education	Initiate Phase "9" BREAKDOWN tabulation of all initiators according to severity criteria (provide ranking data for the initiators)	
Determine potential for education for high ranking initiators (use Appendix O)		
Identify the high priority accident initiators for the selected accident types; use ranking data and other specified considerations		

Identification of Accident Types, Initiators, and Associated Factors

TASKS FOR EDUCATION ANALYST	TASKS FOR COMPUTER SUPPORT PERSONNEL	TASKS FOR CODER SUPPORT PERSONNEL
Specify the high priority accident initiators to computer support personnel to begin identification of associated factors	Initiate Phase "10" BREAKDOWN tabulation for associated factors in accidents caused by selected high priority initiators, according to severity criteria restricted by accident type(s) and initiators	
Identify the high priority associated factors for the selected type and initiators		
Specify accident report numbers (BARs) to retrieve information for operator demographics; accident reports should be retrieved for all boats involved in each accident (in the case of multiple boat accidents)	Initiate Phase "11" to list values for demographic variables for each selected initiator (operator age, hours of boating experience, formal boating instruction, and state in which the accident occurred)	
Compare operator demographic variables with Nationwide Boating Survey statistics (use chi square goodness of fit test)		
Revise operator demographic information to enable interpretation by nonprofessional persons (production personnel, etc.)		
Specify accident report numbers to retrieve operator alternatives for accidents caused by selected initiators; remainder of information will be generated from second computer report (use Appendix D to ensure that alternatives are properly and completely identified)	Phase "11" also produces BREAKDOWN for FRACACC vs. cause vs. operator alternatives. Monitor manual tabulation of operator alternatives by coders if necessary.	Assist in tabulation of operator alternatives if task remains manual effort

Identification of Accident Types, Initiators, and Associated Factors

TASKS FOR EDUCATION ANALYST	TASKS FOR COMPUTER SUPPORT PERSONNEL	TASKS FOR CODER SUPPORT PERSONNEL
Review all alternatives for possible combinations and prioritizing; select, edit, and/or rewrite alternatives in optimal form for determining educational objectives		
Reassemble manually all alternatives within selected accident initiators groups		
Write out educational objectives for selected operator alternatives to address accidents in selected initiator groups		

Specification of Educational Objectives and Guidelines

TASKS FOR EDUCATION ANALYST	TASKS FOR COMPUTER SUPPORT PERSONNEL	TASKS FOR CODER SUPPORT PERSONNEL
Specify accident report numbers to retrieve associated factors for selected accidents (check Appendix E to ensure complete and proper identification of associated factors)		
Write out educational objectives for selected associated factors to address accidents in selected initiator groups		
Prepare summary report itemizing guidelines and objectives for education programs; report is to be used for planning and production of programs		

APPENDIX G. COMPUTER SOFTWARE DOCUMENTATION AND COMPUTER SUPPORT INSTRUCTIONS FOR RECREATIONAL BOATING SAFETY EDUCATION METHODOLOGY (RBSEM)*

Table of Contents

---

* Prepared by Katherine F. Redick of Control Data Corporation and the support staff at the Atlanta, Georgia, CDC facility.

APPENDIX G. COMPUTER SOFTWARE DOCUMENTATION AND COMPUTER SUPPORT INSTRUCTIONS FOR RECREATIONAL BOATING SAFETY EDUCATION METHODOLOGY (RBSEM)*

Table of Contents

ATTACHMENTS

---

* Prepared by Katherine F. Redick of Control Data Corporation and the support staff at the Atlanta, Georgia, CDC facility.

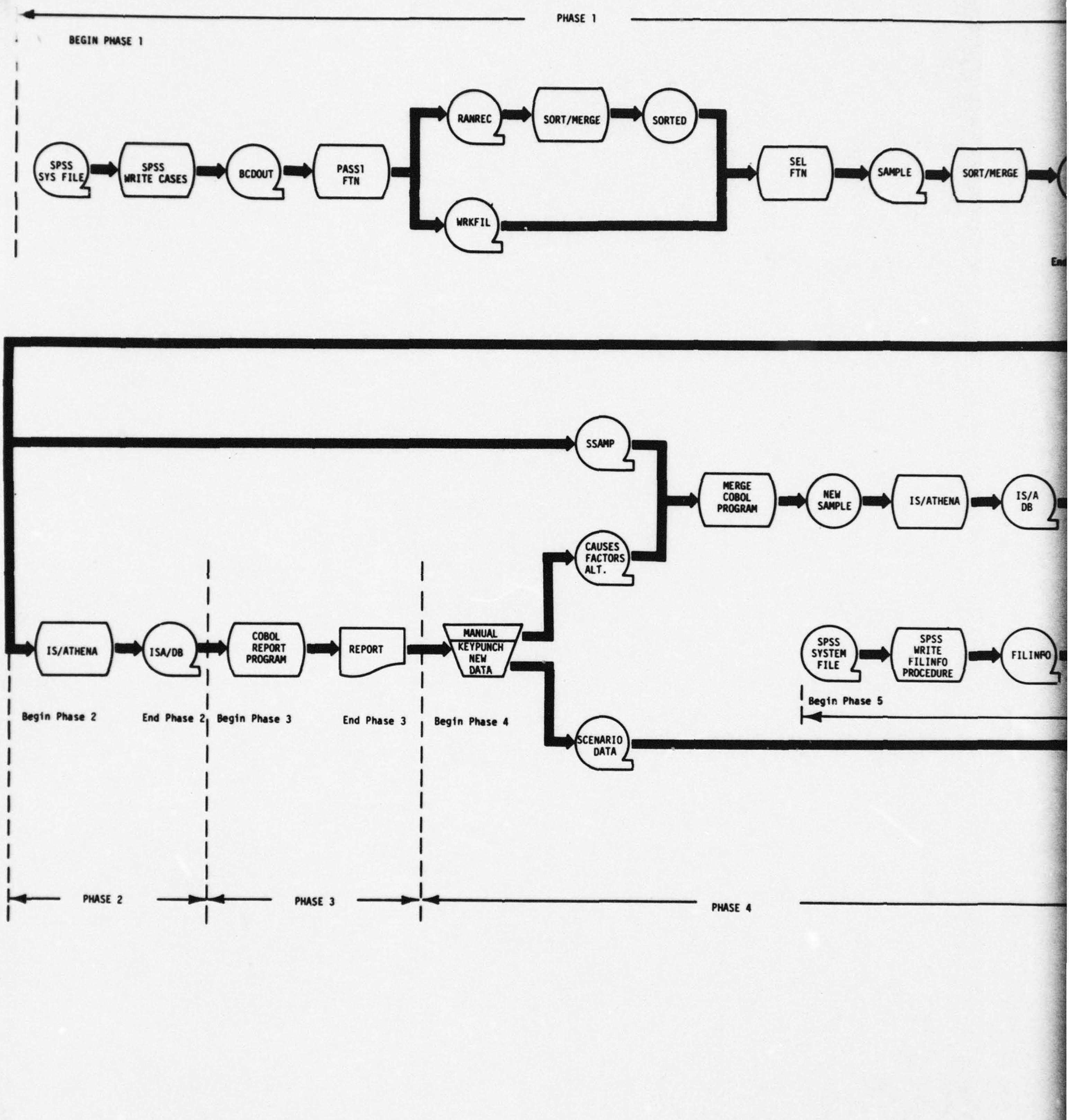
I. INTRODUCTION

The Computer Support Instruction Booklet contains all instructions necessary for the computer support analyst to execute all of the automated portions of the Recreational Boating Safety Education Methodology (RBSEM). Computer operations are divided into phases, each phase being a NOS procedure file. It is assumed in the following explanations that the computer analyst has a working knowledge of the CYBERNET NOS Operating System KB located in Rockville, Maryland.

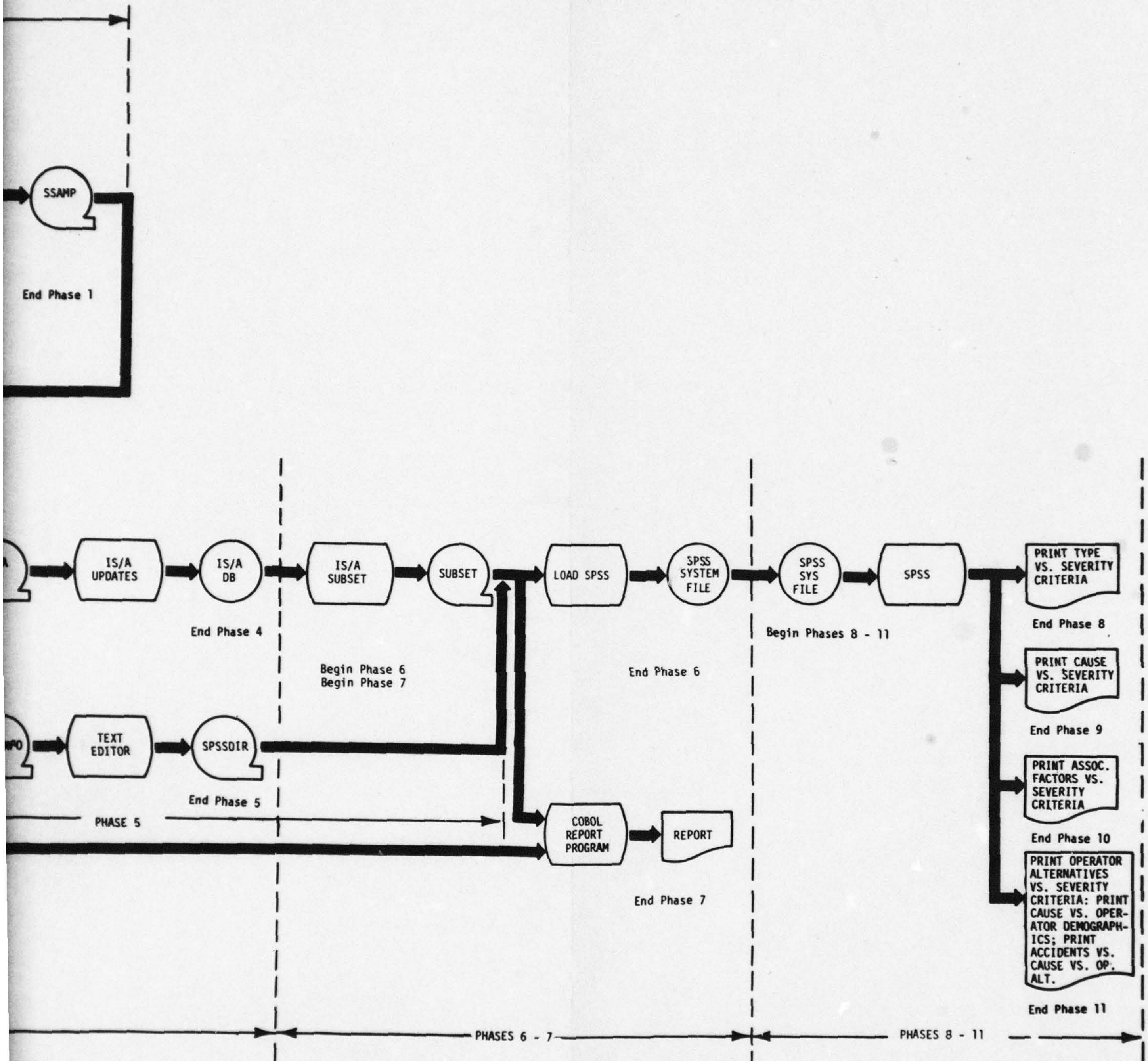
Execution of the entire system requires the use of 61 files. Two additional files, ZZZUTIL and ZZZERIK, are provided to load files from tape and dump files to tape. All files are currently stored on two tapes in the Rockville, Maryland facility. The VSN's of these tapes are KW4826 and KW3433. The two tapes are identical.

Proper execution of the system requires that the order of the variables in the original SPSS system file does not change. If this should change, all PHASE's using the system file should be examined (see section V). Also, any file names that may change from year to year (e.g., SB76FL or NEW76SP) must have every reference to that name changed. Section V contains a cross reference of each file and where it is used.

This system was developed with the user in mind, and should therefore be an extremely effective tool in the study and analysis of boating accidents for educational purposes.



PHASE 1
BEGIN PHASE 1
SPSS SYS FILE
SPSS WRITE CASES
BCDOUT
PASS1 FTN
RANREC
SORT/MERGE
SORTED
WRKFIL
SEL FTN
SAMPLE
SORT/MERGE
SSAMP
MERGE COBOL PROGRAM
NEW SAMPLE
IS/ATHENA
IS/A DB
CAUSES FACTORS ALT.
IS/ATHENA
ISA/DB
COBOL REPORT PROGRAM
REPORT
MANUAL KEYPUNCH NEW DATA
SPSS SYSTEM FILE
SPSS WRITE FILINFO PROCEDURE
FILINFO
Begin Phase 5
Begin Phase 2
End Phase 2
Begin Phase 3
End Phase 3
Begin Phase 4
SCENARIO DATA
PHASE 2
PHASE 3
PHASE 4



SECTION II. COMPUTER SOFTWARE FLOWCHART FOR RBSEM DATA MANAGEMENT SYSTEM

SECTION III. LOG-IN PROCEDURE AND FILE ACCESS

LOG-IN PROCEDURE

Log-in to the NOS KB system is as follows:

1. Dial the local number for system KB. At the solid tone, place the phone in the carrier.

2. The system responds with 2 slashes (//). You respond with a carriage return.

3. You are then requested to sign on. Type in your family name - KB and your user name, then a carriage return.

4. The system then asks for your password. Type in your password and a carriage return.

5. The system then asks for your charge number. Type in your charge and a carriage return.

6. You are now logged on to system KB.

Steps 2 through 5 are shown as follows:

```
                Step2
// CR
NET U51055
PLEASE SIGN ON--KB,X0712DC CR Step3
 78/12/28. 16.01.55.
EASTERN CYBERNET CENTER SN166 NOS           1.0/411.552.0-1
PASSWORD
[redacted] CR step4
TERMINAL:      226,11Y
RECOVER/ CHARGE: CHARGE,S7712MK,*EDU* CR   step5
READY.
```

FILE ACCESS

ZZZUTIL is a procedure file that may be used to load some or all files from tape. It may also be used to dump some or all files to tape.

Two files must always reside on disk for the utility to work correctly. They are ZZZUTIL and ZZZERIK.

To use the utility, first the tape must be mounted. All files are currently stored on tape KW4826. To mount this tape, enter the BATCH subsystem and type the following. (The tape must be requested as ZZZTAPE)

```
/REQUEST,ZZZTAPE,NT,PE,F=I,PO=R,LB=KU,VSN=KW4826
M161, ASSIGNED TO ZZZTAPE, VSN=KW4826.
```

Once the tape is mounted, files may be loaded to disk as follows.

```
/-ZZZUTIL,S=ZLOAD

   DUMP/LOAD UTILITY - V2.0


SELECT ONE OF THE FOLLOWING...
      LIST    = LIST FILE NAMES ON TAPE
      LOADALL = LOAD ALL FILES FROM TAPE
      SELLOAD = LOAD ONLY SELECTED FILES FROM TAPE
      SELOMIT = LOAD ALL EXCEPT SELECTED FILES FROM TAPE
      UPDATE  = LOAD ALL FILES NOT ON DISK
? SELLOAD
ENTER SELECTED FILE NAMES SEPERATED BY COMMAS.
A PERIOD TERMINATES ENTRIES.
? PHASE1,PHASE2,PHASE3.

 FILE CONTROL CARDS READY TO PROCESS.
COMMENT. --- END OF RUN ---
/CATLIST
 CATALOG OF X0/12DC                              78/12/28. 20.46.43.

  FILE NAME(S) -


 PHASE2    PHASE3    PHASE1    ZZZERIK   ZZZUTIL   ZZZZZZZ   TEMP

          7 FILE(S)
/-ZZZUTIL,S=ZLOAD

   DUMP/LOAD UTILITY - V2.0


SELECT ONE OF THE FOLLOWING...
      LIST    = LIST FILE NAMES ON TAPE
      LOADALL = LOAD ALL FILES FROM TAPE
      SELLOAD = LOAD ONLY SELECTED FILES FROM TAPE
      SELOMIT = LOAD ALL EXCEPT SELECTED FILES FROM TAPE
      UPDATE  = LOAD ALL FILES NOT ON DISK
? LIST

 CATALOG OF                              78/12/28.
ZZZUTIL   BCDOUT    COMENTS   COM10A    COM11A    COM8A     COM9A
DEFBLD1   DEFBLD    DICT01    DICT      FILINFO   INFOIN    ISABIN
ISABLD1   ISABLD    ISADEF1   ISADEF    ISAWRYT   ISBWRYT   MERGDAT
MERGE     NEWSAMP   NEW76SP   PASS1B    PASS1     PHASE0    PHASE10
PHASE11   PHASE1    PHASE2    PHASE3    PHASE4    PHASE5    PHASE6
PHASE7    PHASE8    PHASE9    RANREC    RBSEM     REPB1     REPB2
REP1      REP2      SAMPLE    SB76FL    SCENARO   SELB      SEL
SORTED    SORTIN    SORTOUT   SPCOM1    SPIN      SPOUT     SPSSDIR
SPSSIN    SRTINP    SSAMP     SUBSET1   SUBSET    WRKFIL    ZZZERIK
ZZZZZZZ
          64 FILE(S)

 LIST COMPLETE - MAKE NEW SELECTION.
```

As you see, you have several options in the way in which files are loaded. The file ZZZZZZZ is automatically saved in the catalog. It contains the dayfile from the load and may be purged.

In order to dump files to tape, the tape must first be mounted with write enable. Enter the BATCH subsystem and type the following. (Tape must be requested as ZZZTAPE).

```
REQUEST,ZZZTAPE,NT,PE,F=I,PO=W,LB=KU,VSN=KW4826
NT61, ASSIGNED TO ZZZTAPE, VSN=KW4826.
```

Once the tape has been mounted, files may be dumped to tape as follows.

```
/-ZZZUTIL,S=1DUMP

    DUMP/LOAD UTILITY - V2.0

SELECT ONE OF THE FOLLOWING...
      LIST    = LIST FILE NAMES ON DISK
      DUMPALL = DUMP ALL FILES FROM DISK
      SELDUMP = DUMP ONLY SELECTED FILES FROM DISK
      SELOMIT = DUMP ALL EXCEPT SELECTED FILES FROM DISK
      UPDATE  = LOAD ALL FILES NOT ON DISK
                THEN DUMP ALL FILES TO TAPE
? SELDUMP
ENTER SELECTED FILE NAMES SEPERATED BY COMMAS.
A PERIOD TERMINATES ENTRIES.
? SSAMP,SB76FL,PHASE1
? .

 FILE CONTROL CARDS READY TO PROCESS.
COMMENT. --- END OF RUN ---
```

Again, there are several options in the way files are dumped.

TAPE TRANSFER FROM SCOPE TO NOS

The SPSS system is created each year on the ECZ CYBERNET CYBER 175 under the SCOPE 3.4 operating system. The RBSEM analysis, however, makes use of not only SPSS but also IS/ATHENA which resides on the CYBERNET CYBER 175 under the NOS operating system. Consequently, the SCOPE tape containing the SPSS data must initially be moved to the NOS system. To do this, a job must be submitted to the SCOPE system as follows:

```
NEWTP,NT2.
USER,XXXXXXX,XXXXXXX.
PROJECT,*XXX*.
VSN(TAPE1=S02077)
LABEL(TAPE1,R,L=BAR*SPSS*BY*YEAR,FID,ID=X0704DC)
REQUEST(TAPE2,NT,PE,SV,N,RING,US)
COPYBF,TAPE1,TAPE2,8.
Q
```

The VSN number (S02077) may of course change from year to year.

This procedure reads the SCOPE tape and copies it to another SCOPE tape. The SCOPE dayfile then displays the VSN number of the new tape.

```
ECZ    ECZ  SCOPE 3.4.3     405F.197  09/03/74
13.49.27.[illegible]IP7C  FROM     /44
13.49.27.ISIP. INPUT  .00000001 IOD-S. ***/44. DC= 01.
13.49.29.[illegible]STP.NT2.
13.49.29.
13.49.31.USER(X071203.)
13.49.31.ATTENTION - PLEASE CHANGE YOUR CDC
13.49.31.SUPPLIED PASSWORD.
13.49.33.PROJECT.*EDU*.
13.49.35.ACCT. 57712. *EDU*
13.49.35.VSN(TAPE1=S52077)
13.49.54.LABEL(TAPE1,R,L=*4*SPSS*BY*YEAR,FI0.ID=
13.49.54.X0704DC)
13.49.53.SVSN= 052077. NOT IN FILE LONG TERM AREA
13.52.13.MT50 VOLUME SERIAL NUMBER IS  052077
13.52.13.MT50 ASSIGNED TO  TAPE1
13.52.29.SVSN= 052077. RD ACCESS GRANTED
13.52.29. LABEL READ WAS     *4*SPSS*BY*YEAR
13.52.29.    EDITION NUMBER    01
13.52.29.    RETENTION CYCLE   999
13.52.29.    CREATION DATE     77335
13.52.29.    REEL NUMBER       0001
13.52.30.REQUEST(TAPE2,HT,PE,SV,N,RING,US)
13.52.34.SVSN= S1244R. RESERVED
13.54.18.MT54 VOLUME SERIAL NUMBER IS  S1244R
13.54.18.MT54 ASSIGNED TO  TAPE2
13.54.18.COPYBF,TAPE1,TAPE2,A.
13.54.28.SVSN= S1244R. WR ACCESS GRANTED
14.00.32.ISIP. OUTPUT .00000001 IOD-S, ***/44. DC= 40.
14.00.32.MT54  BLOCKS WRITTEN =005316
14.00.34.ISSG. ENTERED QUEUE 13.48.39  73270
14.00.34.ISSG.        283.654 EXECUTION TIME
14.00.34.MS    10752  WORDS  (        0 MAX USED)
14.00.34.CPA        2.042 SEC.
14.00.34.IO       277.289 SEC.
14.00.34.CM      1137.779 KWS.
14.00.34.ISSG,          14.523 TOTAL SRUS NON-APPLICATION
14.00.34.PP        669.997 SEC.      DATE 09/27/78
14.00.34.EJ  END OF JOB, 44
```

After this is done, another job must be submitted, asking computer operations personnel tc move the newly created tape from the SCOPE system to the NOS system. This is done as follows:

```
KFR,P4.
USER,XXXXXXX,XXXXXXX.
PROJECT,*XXX*.
REQUEST,INFO,*PF.
INFORM,INFO,C.
INFORM.  PLEASE MOVE A RECENTLY CREATED TAPE FROM SYSTEM ECZ TO
INFORM.  SYSTEM KB.  THE VSN NUMBER ON ECZ IS VSN=S12448. THE CHARGE
INFORM.  NUMBER FOR BOTH SYSTEMS IS           AND THE
INFORM.  PROJECT NUMBER IS
INFORM.  THE USER NUMBER ON BOTH SYSTEMS IS
INFORM.  THIS TAPE IS TO BE PERMANENTLY STORED ON SYSTEM KB.
INFORM.  PLEASE CALL                    AT TELEPHONE NUMBER
INFORM.  WHEN THIS IS DONE.
@
```

After the move has been made, computer operations personnel in Rockville, MD will call the computer support analyst and give him/her the new VSN number of the tape under the NOS operating system.

PHASEO

PHASEO is a procedure file that requests and has mounted the newly created tape (Note that in this case, the VSN number assigned on NOS was KW4333). It then copies the SPSS system file to a disk file. This year's system file was the first file on the tape and was named SB76FL. This may change from year to year. An SPSS procedure is then executed to write a sequential data file from the SPSS system file. It is named BCDOUT and is then stored on disk.

To execute PHASEO, type the following:

```
-PHASE0

 SPSS/ONLINE V7.0/NOS

  USE AN SPSS SYSTEM FILE THIS RUN
 ENTER FILE NAME
 USE A RAW DATA FILE THIS RUN
 AUTO-MODE.
 ENTERING SPSS.
 SPSS/ONLINE AUTO-MODE

  USED   -     87.33US

READY.
```

Listings of PHASE0 and associated files follow.

```
OLD,PHASE0
READY.
LNH
00100 VSN(TAPE=KW4333=S12448)
00110 REQUEST(TAPE,NT,PE,PO=R,LB=KL,F=SI)
00120 PURGE,SB76FL/NA.
00130 DEFINE,SB76FL.
00140 COPYBF,TAPE,SB76FL.
00150 UNLOAD,TAPE.
00160 RETURN,TAPE.
00170 PURGE,BCDOUT/NA.
00180 DEFINE,BCDOUT.
00190 PURGE,SPOUT/NA.
00200 DEFINE,SPOUT.
00210 RETURN,SB76FL.
00220 ATTACH,GTFILE=SB76FL.
00230 GET,TEMP=SPCOM1.
00240 GET,INPUT=SPIN.
00250 CALL,SPSS.
00260 RETURN,INPUT.
READY.
```

```
OLD,SPIN
READY.
LNH
YES
GTFILE
NO
SREAD TEMP
PAGE 9999
EXECUTE SPOUT
END
READY.
```

```
OLD,SPCOM1
READY.
LNH
GET FILE        SB76FL
RUN NAME        SPSS WRITE CASES-SB76FL
SUBFILE LIST    TEST(1000),REST(8012)
RUN SUBFILES    TEST
WRITE CASES     (F5.0,F4.0,F1.0,F2.0,1HE,F1.0,F1.0,
                F2.0,1HI,F1.0,A3,1HA,F1.0,F1.0,
                F1.0,F3.0,F2.0,F2.0,F2.0,
                F2.0,F1.0,F2.0,1HW,F1.0,A2,
                F3.0,F2.0,F1.0,1HC,F1.0,1HS,F1.0,
                2F1.0,1HO,F2.0,1HT,2F2.0,
                F2.0,F1.0,F5.0,F1.0,F1.0,
                2F1.0,3F2.0,
                4F2.0,F5.0,
                2F1.0,F4.2)
                SERIAL,SEQNUM,JURIS,OPAGE,OPEXPER,RENTED,
                POB,FORINST,MFGCODE,TYPEBOAT,HULLMAT,
                PROPUL,POWER,LENGTH,YRBUILT,MONTH,
                DAY,YEAR,TIME,WATERTYP,STATE,
                COUNTY,DISTRICT,WEATHER,WATERCON,SEATEMP,
                WIND,VISIBIL,OPATTIME,TYPE1,TYPE2,
                TYPE3,PFDS,PROPDAM,DROWNVIC,OTHERVIC,
                INJURIES,NUMBVES,CAUSE1,CAUSE2,CAUSE3,
                DESC1,DESC2,DESC3,DESC4,JULDATE,
                DAYOFWK,FATALS,FRACACC
READY.
```

PHASE1

PHASE1 is a procedure file that attaches the sequential SPSS data file and executes a FORTRAN program called PASS1. PASS1 analyzes the data and appends a random number to each record. After this, a sort procedure is executed that sorts the output file from PASS1 (RANREC) by ascending random number to produce a file called SORTED. A second FORTRAN program called SEL is then executed to generate a sample of the data. Its output file is called SAMPLE. SAMPLE is then sorted into ascending serial number sequence creating a file called SSAMP.

To execute PHASE1, type the following:

```
-PHASE1
1


                    SUMMARY OF THE BAR ACCIDENT FILE


                                      FATAL                              NON-FATAL
  TYPE      TOTAL              GOOD              BAD              GOOD           BAD

    1.        71                  1                0                66             4
    2.        69                 35                7                26             1
    3.        33                  7                2                23             1
    4.        43                  3                1                35             4
    5.        38                  2                0                34             2
    6.        17                  0                0                14             3
    7.       472                  5                1               427            39
    8.        78                 10                0                64             4
    9.        56                  5                0                47             4
   10.        34                 25                4                 5             0
   11.         0                  0                0                 0             0
   12.        16                  3                0                13             0
1          7 C   D I R E C T I V E S                                     SORT/MERG
 L433  78/12/12. 11.07.30.        PAGE

       1  SORT
       2  FILE,INPUT=RANREC(R),OUTPUT=SORTED(R)
       3  FIELD,SERNO(1,5,DISPLAY)
       4  FIELD,RAND(102,10,DISPLAY)
       5  FIELD,MULBOT(112,1,DISPLAY)
       6  KEY,RAND(A),SERNO(A),MULBOT(D)
       7  END

1
```

BAR SAMPLING PROGRAM

```
 IN THE BOATING ACCIDENT REPORT FILE, THERE ARE .    927 RECORDS
    677 OF THESE ARE FROM THE CATEGORY COLLISION .  HOW MANY
 RECORDS SHOULD BE SELECTED FROM THIS CATEGORY FOR THE SAMPLE
? 5
  REQUESTED SAMPLE SIZE IS    .74 PERCENT
         2  GROUNDING RECORDS WILL BE SELECTED
         4 COL W/BOAT RECORDS WILL BE SELECTED
         2 COL(FIXED) RECORDS WILL BE SELECTED
         2 COL(FLOAT) RECORDS WILL BE SELECTED

  ACTUAL SAMPLE SIZE IS   1.48 PERCENT
 5 FATAL RECORDS WILL BE SELECTED(50 PERCENT)
 100 PERCENT OF THE SAMPLE IS GOOD RECORDS

  TO CHANGE FREQUENCY FOR THIS CATEGORY,
  ENTER YES(OTHERWISE ENTER NO)
? NO
 IN THE BOATING ACCIDENT REPORT FILE, THERE ARE      927 RECORDS.
    179 OF THESE ARE FROM THE CATEGORY LOADING   .  HOW MANY
 RECORDS SHOULD BE SELECTED FROM THIS CATEGORY FOR THE SAMPLE
? 5
  REQUESTED SAMPLE SIZE IS   2.79 PERCENT
         2  CAPSIZING RECORDS WILL BE SELECTED
         2   SWAMPING RECORDS WILL BE SELECTED
         2    SINKING RECORDS WILL BE SELECTED
         2 FALLS OVER RECORDS WILL BE SELECTED

  ACTUAL SAMPLE SIZE IS   4.47 PERCENT
 4 FATAL RECORDS WILL BE SELECTED(50 PERCENT)
 100 PERCENT OF THE SAMPLE IS GOOD RECORDS

  TO CHANGE FREQUENCY FOR THIS CATEGORY,
  ENTER YES(OTHERWISE ENTER NO)
? NO
 IN THE BOATING ACCIDENT REPORT FILE, THERE ARE      927 RECORDS.
     55 OF THESE ARE FROM THE CATEGORY FIRE/EXPL .  HOW MANY
 RECORDS SHOULD BE SELECTED FROM THIS CATEGORY FOR THE SAMPLE
? 5
  REQUESTED SAMPLE SIZE IS   9.09 PERCENT
         4  EXPL FUEL RECORDS WILL BE SELECTED
         1 EXPL NFUEL RECORDS WILL BE SELECTED

  ACTUAL SAMPLE SIZE IS   9.09 PERCENT
 2 FATAL RECORDS WILL BE SELECTED(39 PERCENT)
 100 PERCENT OF THE SAMPLE IS GOOD RECORDS

  TO CHANGE FREQUENCY FOR THIS CATEGORY,
  ENTER YES(OTHERWISE ENTER NO)
? NO
 IN THE BOATING ACCIDENT REPORT FILE, THERE ARE      927 RECORDS.
     16 OF THESE ARE FROM THE CATEGORY OTHER      .  HOW MANY
 RECORDS SHOULD BE SELECTED FROM THIS CATEGORY FOR THE SAMPLE
? 5
  REQUESTED SAMPLE SIZE IS  31.25 PERCENT
         0 FALL(BOAT) RECORDS WILL BE SELECTED
         6  HIT(PROP) RECORDS WILL BE SELECTED

  ACTUAL SAMPLE SIZE IS  37.50 PERCENT
 3 FATAL RECORDS WILL BE SELECTED(50 PERCENT)
 100 PERCENT OF THE SAMPLE IS GOOD RECORDS
```

```
TO CHANGE FREQUENCY FOR THIS CATEGORY,
ENTER YES(OTHERWISE ENTER NO)
? NO

30 RECORDS SELECTED AND WRITTEN TO SAMPLE FILE
REPRESENTING A 3 PERCENT SAMPLE OF THE BAR FILE
THE SAMPLE CONSISTS OF 29 (96 PERCENT) GOOD RECORDS
1            7 C    D I R E C T I V E S                                    SORT/MERGE
L433  78/12/12. 11.11.18.        PAGE    1

        1  SORT
        2  FILE,INPUT=SAMPLE(R),OUTPUT=SSAMP(R)
        3  FIELD,SERNO(1,9,DISPLAY)
        4  KEY,SERNO(A)
        5  END

READY.
```

A listing of PHASE1 follows. For listings of PASS1 and SEL see Attachment A.

```
OLD,PHASE1
READY.
LNH
00100 GET,PASS1B.
00110 ATTACH,SPSOUT=BCDOUT.
00115 FILE(SPSOUT,BT=C,RT=Z,FL=101)
00116 LDSET(FILES=SPSOUT)
00120 PASS1B.
00130 REPLACE,WRKFIL,RANREC.
00140 REWIND,WRKFIL,RANREC.
00150 GET,SORTIN.
00160 FILE(RANREC,BT=C,RT=Z,FL=113,BFS=5200)
00170 FILE(SORTED,BT=C,RT=Z,FL=113,BFS=5200)
00175 RFL,100000.
00180 SORTMRG(I=SORTIN,O=LIST1)
00185 REWIND,LIST1.
00187 COPY,LIST1.
00190 REPLACE,SORTED.
00210 2RUN,GET,SELB,SORTED,WRKFIL.
00220 SELB.
00230 REWIND,SAMPLE.
00240 REPLACE,SAMPLE.
00250 FILE(SAMPLE,BT=C,RT=Z,FL=121,BFS=2600)
00260 FILE(SSAMP,BT=C,RT=Z,FL=121,BFS=2600)
00270 GET,SORTOUT.
00275 RFL,100000.
00280 SORTMRG(I=SORTOUT,O=LIST2)
00285 REWIND,LIST2.
00287 COPY,LIST2.
00290 REWIND,SSAMP.
00300 REPLACE,SSAMP.
READY.
```

PHASE2

PHASE2 attaches the data file SSAMP created by PHASE1 and loads an IS/ATHENA data base according to the data base definition specifications contained on the file DICT. (Creation of the file DICT is described in the following section.)

To execute PHASE2, type the following:

```
-PHASE2
IS-ATHENA VER 2.0K DATE COMPILE IS  78/07/20.
TODAY'S DATE IS  12/12/78. JULIAN DATE IS      28835
PROCESS.

 BUILD DATABASE COMPLETE
INPUT RECORDS = 000030
DB RECORDS = 000030
ATHENA IS FINISHED
READY.
```

Listings of PHASE2, ISABLD, and ISABIN follow.

```
OLD,PHASE2
READY.
LNH
00100 GET,SUBSET=SSAMP.
00110 ATTACH,DICT.
00120 PURGE,RBSEM/NA.
00130 RETURN,RBSEM.
00140 DEFINE,RBSEM.
00150 GET,COMMAND=ISABLD.
00160 GET,INPUT=ISABIN.
00170 CALL,ISAV2.
00180 RETURN,INPUT.
00190 RETURN,SUBSET.
READY.
```

```
OLD,ISABLD
READY.
LNH
RECORD,121,RBSEM,9.
DICTIONARY.
BUILD,DATABASE,WHERE,KEY=SERIAL,SEQNUM.
FINISH.
READY.
```

```
OLD,ISABIN
READY.
LNH
PROCESS.
READY.
```

DEFBLD

DEFBLD is a procedure file used to create the file DICT used by IS/ATHENA. DEFBLD attaches a file of data base specifications called ISADEF and from it creates the data base definition. This procedure does not need to be executed again unless the data base specifications should change. In that case, the file ISADEF must be modified and DEFBLD executed to recreate DICT. To execute DEFBLD, type the following:

```
-DEFBLD
IS-ATHENA VER 2.0K DATE COMPILE IS  78/07/20.
TODAY'S DATE IS  12/12/78. JULIAN DATE IS       28835
? PROCESS.
DICTIONARY KEY INSERTED = SERIAL
DICTIONARY KEY INSERTED = SEQNUM
DICTIONARY KEY INSERTED = JURIS
DICTIONARY KEY INSERTED = OPAGE
DICTIONARY KEY INSERTED = OPEXPERD
DICTIONARY KEY INSERTED = OPEXPER
DICTIONARY KEY INSERTED = OPEXPERL
DICTIONARY KEY INSERTED = RENTED
DICTIONARY KEY INSERTED = POB
DICTIONARY KEY INSERTED = FORINSTD
DICTIONARY KEY INSERTED = FORINST
DICTIONARY KEY INSERTED = FORINSTL
DICTIONARY KEY INSERTED = MFGCODE
DICTIONARY KEY INSERTED = TYPEBOATD
DICTIONARY KEY INSERTED = TYPEBOAT
DICTIONARY KEY INSERTED = TYPEBOATL
DICTIONARY KEY INSERTED = HULLMAT
DICTIONARY KEY INSERTED = PROPUL
DICTIONARY KEY INSERTED = POWER
DICTIONARY KEY INSERTED = LENGTH
DICTIONARY KEY INSERTED = YRBUILT
DICTIONARY KEY INSERTED = MONTH
DICTIONARY KEY INSERTED = DAY
DICTIONARY KEY INSERTED = YR
DICTIONARY KEY INSERTED = TIME
DICTIONARY KEY INSERTED = WATERTYPD
DICTIONARY KEY INSERTED = WATERTYP
DICTIONARY KEY INSERTED = WATERTYPL
DICTIONARY KEY INSERTED = STATE
DICTIONARY KEY INSERTED = COUNTY
DICTIONARY KEY INSERTED = DISTRICT
DICTIONARY KEY INSERTED = WEATHER
DICTIONARY KEY INSERTED = WATERCOND
DICTIONARY KEY INSERTED = WATERCON
DICTIONARY KEY INSERTED = WATERCONL
DICTIONARY KEY INSERTED = SEATEMPD
DICTIONARY KEY INSERTED = SEATEMP
DICTIONARY KEY INSERTED = SEATEMPL
```

```
DICTIONARY KEY INSERTED = WIND
DICTIONARY KEY INSERTED = VISIBIL
DICTIONARY KEY INSERTED = OPATTIMED
DICTIONARY KEY INSERTED = OPATTIME
DICTIONARY KEY INSERTED = OPATTIMEL
DICTIONARY KEY INSERTED = TYPE1D
DICTIONARY KEY INSERTED = TYPE1
DICTIONARY KEY INSERTED = TYPE1L
DICTIONARY KEY INSERTED = TYPE2
DICTIONARY KEY INSERTED = TYPE3
DICTIONARY KEY INSERTED = PFDS
DICTIONARY KEY INSERTED = PROPDAM
DICTIONARY KEY INSERTED = DROWNVIC
DICTIONARY KEY INSERTED = OTHERVIC
DICTIONARY KEY INSERTED = INJURIES
DICTIONARY KEY INSERTED = NUMBVES
DICTIONARY KEY INSERTED = CAUSE1
DICTIONARY KEY INSERTED = CAUSE2
DICTIONARY KEY INSERTED = CAUSE3
DICTIONARY KEY INSERTED = DESC1
DICTIONARY KEY INSERTED = DESC2
DICTIONARY KEY INSERTED = DESC3
DICTIONARY KEY INSERTED = DESC4
DICTIONARY KEY INSERTED = JULDATE
DICTIONARY KEY INSERTED = DAYOFWEEK
DICTIONARY KEY INSERTED = FATALS
DICTIONARY KEY INSERTED = FRACACC
DICTIONARY KEY INSERTED = RTYPE
DICTIONARY KEY INSERTED = WEIFAT
DICTIONARY KEY INSERTED = WEINJ
DICTIONARY KEY INSERTED = WEIPRO
DICTIONARY KEY INSERTED = SUMFAT
DICTIONARY KEY INSERTED = E0
DICTIONARY KEY INSERTED = E1
DICTIONARY KEY INSERTED = E2
DICTIONARY KEY INSERTED = E3
DICTIONARY KEY INSERTED = E4
DICTIONARY KEY INSERTED = E9
DICTIONARY KEY INSERTED = I0
DICTIONARY KEY INSERTED = I1
DICTIONARY KEY INSERTED = I2
DICTIONARY KEY INSERTED = I3
DICTIONARY KEY INSERTED = I4
DICTIONARY KEY INSERTED = I5
DICTIONARY KEY INSERTED = I6
DICTIONARY KEY INSERTED = I9
DICTIONARY KEY INSERTED = A1
DICTIONARY KEY INSERTED = A2
DICTIONARY KEY INSERTED = A3
DICTIONARY KEY INSERTED = A4
DICTIONARY KEY INSERTED = A5
DICTIONARY KEY INSERTED = A6
DICTIONARY KEY INSERTED = A7
DICTIONARY KEY INSERTED = A8
DICTIONARY KEY INSERTED = A9
DICTIONARY KEY INSERTED = A0
DICTIONARY KEY INSERTED = W1
DICTIONARY KEY INSERTED = W2
DICTIONARY KEY INSERTED = W3
DICTIONARY KEY INSERTED = W4
DICTIONARY KEY INSERTED = W5
DICTIONARY KEY INSERTED = W6
DICTIONARY KEY INSERTED = W9
DICTIONARY KEY INSERTED = C1
DICTIONARY KEY INSERTED = C2
DICTIONARY KEY INSERTED = C3
DICTIONARY KEY INSERTED = C4
DICTIONARY KEY INSERTED = C5
DICTIONARY KEY INSERTED = C9
DICTIONARY KEY INSERTED = S1
DICTIONARY KEY INSERTED = S2
DICTIONARY KEY INSERTED = S3
DICTIONARY KEY INSERTED = S4
DICTIONARY KEY INSERTED = S5
DICTIONARY KEY INSERTED = S6
DICTIONARY KEY INSERTED = S7
DICTIONARY KEY INSERTED = S8
DICTIONARY KEY INSERTED = S9
DICTIONARY KEY INSERTED = O00
DICTIONARY KEY INSERTED = O10
DICTIONARY KEY INSERTED = O11
DICTIONARY KEY INSERTED = O12
DICTIONARY KEY INSERTED = O13
DICTIONARY KEY INSERTED = O20
DICTIONARY KEY INSERTED = O21
DICTIONARY KEY INSERTED = O22
DICTIONARY KEY INSERTED = O23
DICTIONARY KEY INSERTED = O24
DICTIONARY KEY INSERTED = O30
DICTIONARY KEY INSERTED = O31
DICTIONARY KEY INSERTED = O40
DICTIONARY KEY INSERTED = O50
DICTIONARY KEY INSERTED = O51
DICTIONARY KEY INSERTED = O60
DICTIONARY KEY INSERTED = O61
DICTIONARY KEY INSERTED = O62
DICTIONARY KEY INSERTED = O63
DICTIONARY KEY INSERTED = O70
DICTIONARY KEY INSERTED = O71
DICTIONARY KEY INSERTED = O72
DICTIONARY KEY INSERTED = O73
DICTIONARY KEY INSERTED = O80
DICTIONARY KEY INSERTED = O81
DICTIONARY KEY INSERTED = O99
DICTIONARY KEY INSERTED = T00
DICTIONARY KEY INSERTED = T01
DICTIONARY KEY INSERTED = T02
DICTIONARY KEY INSERTED = T03
DICTIONARY KEY INSERTED = T04
DICTIONARY KEY INSERTED = T05
DICTIONARY KEY INSERTED = T06
DICTIONARY KEY INSERTED = T07
DICTIONARY KEY INSERTED = T08
DICTIONARY KEY INSERTED = T09
DICTIONARY KEY INSERTED = T10
DICTIONARY KEY INSERTED = T11
DICTIONARY KEY INSERTED = T12
DICTIONARY KEY INSERTED = T98
DICTIONARY KEY INSERTED = T99
ATHENA IS FINISHED
READY
```

Listings of DEFBLD follow. For the listing of ISADEF, see Attachment A.

```
OLD,DEFBLD
READY.
LNH
00100 PURGE,DICT/NA.
00110 DEFINE,DICT.
00120 GET,COMMAND=ISADEF.
00130 CALL,ISAV2.
READY.
```

PHASE3

PHASE3 is a procedure file used to write a sequential data file (SUBSET) from the IS/ATHENA data base and then using SUBSET produce a one page report on each record in the file.

To execute PHASE3, type the following:

```
-PHASE3
IS-ATHENA VER 2.0K DATE COMPILE IS  78/07/20.
TODAY'S DATE IS  12/12/78. JULIAN DATE IS       28835
PROCESS.

 ATHENA IS FINISHED
READY.
```

Listings of PHASE3, ISAWRYT, and ISABIN follow.

```
OLD,PHASE3
READY.
LNH
00100 PURGE,SUBSET/NA.
00110 DEFINE,SUBSET.
00120 ATTACH,DICT.
00130 ATTACH,RBSEM.
00140 GET,COMMAND=ISAWRYT.
00150 GET,INPUT=ISABIN.
00160 CALL,ISAV2.
00170 RETURN,INPUT.
00180 RETURN,SUBSET.
00190 ATTACH,DISK1=SUBSET.
00200 GET,REPBIN.
00210 REPBIN.
00220 REWIND,DISK2.
00230 DISPOSE,DISK2=PR/EI=X0712DC.
00240 RETURN,SUBSET.
READY.
```

```
OLD,ISAWRYT
READY.
LNH
RECORD,121,RBSEM,9.
DICTIONARY.
SPACING,0.
SUBSIZE,404.
SUBSET,SERIAL,SEQNUM,JURIS,OPAGE,OPEXPERL,RENTED,
POB,FORINSTL,MFGCODE,TYPEBOATL,HULLMAT,PROPUL,POWER,
LENGTH,YRBUILT,MONTH,DAY,YR,TIME,WATERTYPL,STATE,
COUNTY,DISTRICT,WEATHER,WATERCONL,SEATEMPL,WIND,VISIBIL,
OPATTIMEL,TYPE1L,TYPE2,TYPE3,PFDS,PROPDAM,DROWNVIC,
OTHERVIC,INJURIES,NUMBVES,CAUSE1,CAUSE2,CAUSE3,DESC1,
DESC2,DESC3,DESC4,JULDATE,DAYOFWEEK,FATALS,FRACACC,RTYPE,
WHERE,SERIAL>=00000.
FINISH.
READY.
```

```
OLD,ISABIN
READY.
LNH
PROCESS.
READY.
```

PHASE4

After the coding has been completed, the initiators, associated factors, and operator alternatives must be keypunched in the format shown below.

COL 1-5	COL 6-9	COL 10-12	COL 13-28	COL 29-46
Serial No.	Seq. No.	Initiator	Assoc. Factors	Operator Alt.

One card is keypunched for each record. The associated factors and the operator alternatives are keypunched in numerical order, left-justified in the assigned field. Up to eight associated factors may be coded. Following is a sample set of keypunched cards.

```
ATTACH,MERGDAT
READY.

LNH,F=MERGDAT
0101200160430102            501502
0101600192100103            701
01029003432301              501
0103700424110204            801
01055006641401              801
01061007401901              101
0106500783330203            501
01094011441803              501502
01097011803103              101102
0112501530750104            257258
0113001583320106            502
0204502190260107            101
0208102497250102            401402
0302802853300102            501
0303202890650104            201202
0307103340240304            103
030710335024                103104
03103037541904              801802
03132041107501              257258
04003042002401              103104
04007042403106              104
04012043103105              110
04012043203106              110
04034045107507              201
040440460024                101102
05016050341406              803
05061056007504              258
0508305900310102            103
05116063233303              504
05327092241803              802
READY.
```

After the computer support analyst has had these cards keypunched, they must be read into the computer and saved on a disk file called MERGDAT. The NOS control language to do that is as shown below.

```
PHASE4,P4,T200.
USER,XXXXXXX,XXXXXXX.KB.
CHARGE,XXXXXXX,*XXX*.
PURGE,MERGDAT/NA.
DEFINE,MERGDAT.
COPYBF,INPUT,MERGDAT.
R 7/8/9

        MERGDAT DATA GOES HERE.

6/7/8/9
```

At this same time the scenario data should be keypunched and saved on a disk file called SCENARO. Each scenario may take up to 10 cards. The format is as follows.

COL 1-5	COL 6-9	COL 10-69
Serial No.	Seq. No.	Scenario information

Scenario data should be keypunched in an easily readable manner since it will appear in future reports exactly as it was keypunched.

After the cards are keypunched, they must be read into the computer. The NOS control language to do that is as shown below.

```
PHASE4,P4,T200.
USER,XXXXXXX,XXXXXXX.KB.
CHARGE,XXXXXXX,*XXX*.
PURGE,SCENARO/NA.
DEFINE,SCENARO.
COPYBF,INPUT,SCENARO.
R 7/8/9

        SCENARIOS GO HERE.

6/7/8/9
```

A sample SCENARO file would look as follows.

```
ATTACH,SCENARO
READY.
LNH,F=SCENARO
010550066AOPERATOR WAS TRAVELING FASTER THAN CONDITIONS WARRANTED --
010550066BTHE SUN WAS IN HIS EYES AND THE LAKE WAS ROUGH.  HE
010550066CAPPARENTLY DID NOT SEE THE LOGS AND OTHER DEBRIS IN THE
010550066DWATER AND UPON STRIKING THE DEBRIS HE LOST CONTROL OF THE
010550066EBOAT RESULTING IN THE ACCIDENT.
011300158ATHE BOAT HAD JUST BEEN REFUELED AND WAS LEAVING THE DOCK
011300158BAREA.  THERE WERE FUMES AND SLIGHT SPILLAGE FROM THE
011300158CREFUELING WHICH WERE IGNITED WHEN ONE OF THE OCCUPANTS LIT A
011300158DCIGARETTE.
050040488AOCCUPANTS WERE USING A CHARCOAL GRILL ON THE DECK AND THE
050040488BDEVICE WAS TIPPED OVER DURING A FIGHT AMONG THEM.  BOAT WAS
050040488CTOTALLY DESTROYED BUT THERE WERE KNOW FATALITIES.
050160503AOPERATOR WAS DRUNK AND LOST CONTROL OF HIS BOAT WHICH
050160503BRESULTED IN HIM HITTING A DOCK, 3 MARKER BUEOYS, SIDESWIPING
050160503CA GRAVEL DREGER, WIPING OUT A FLOCK OF DUCKS AND NARROWING
050160503DMISSING A LITTLE OLD LADY IN A GREEN VW DRIVING ON THE
050160503EPERIMETER ROAD AROUND THE LAKE, AND FINALLY COMING TO REST
050160503FIN THE PARK RANGERS LILY POND WHICH IS LOCATED ONLY A FEW
050160503GYARDS FROM THE BEACH AND PICNIC AREAS AND THE ONLY
050160503HINJURY HE RECEIVED WAS A CUT FINGER WHEN HE WAS OPENING A
050160503ICAN OF BEER, JUST BEFORE HE HIT THE DUCKS.
050640563AOPERATOR WAS TRYING TO REFUEL BOAT FROM A 5-GALLON CAN WHILE
050640563BUNDER MOTION AND SPILLED FUEL WHICH WAS IGNITED BY SMOKING
050640563COCCUPANTS.
READY.
```

PHASE4 procedure file is now executed. PHASE4 reads the new data MERGDAT and sorts it into ascending serial number order producing REPDA. It then executes a COBOL program MERGE which combines the records on SSAMP with those on REPDA to create NEWSAMP. Any record on SSAMP that was not coded or keypunched will still appear on NEWSAMP with the cause, operator alternatives and associated factors blank.

Once NEWSAMP is created, PHASE4 uses it along with DICT01, the new data base definition, to rebuild the IS/ATHENA data base. DEFBLD1, the procedure file used to create DICT01, is described in the following section.

To execute PHASE4, type the following:

```
-PHASE4
IS-ATHENA VER 2.0K DATE COMPILE IS  78/07/20.
TODAY'S DATE IS  12/12/78. JULIAN DATE IS      28835
PROCESS.

BUILD DATABASE COMPLETE
INPUT RECORDS = 000030
DB RECORDS = 000030
ATHENA IS FINISHED
READY.
```

Listing of PHASE4 follows.

```
OLD,PHASE4
READY.
LNH
00100 PURGE,NEWSAMP/NA.
00110 DEFINE,NEWSAMP.
00120 GET,SSAMP,SRTINP.
00130 ATTACH,MERGDAT.
00140 RFL,100000.
00150 FILE,SSAMP,BT=C,RT=Z,FL=121,BFS=2600.
00160 FILE,MERGDAT,BT=C,RT=Z,MRL=80,BFS=2600.
00170 FILE,REPDA,BT=C,RT=Z,MRL=80,BFS=2600.
00180 FILE,NEWSAMP,BT=C,RT=Z,FL=173,BFS=2600.
00190 SORTMRG,I=SRTINP,O=SRTOUT.
00200 RETURN,MERGDAT,SRTINP.
00210 GET,MERGE.
00220 COBOL,I=MERGE,L=LMERGE.
00230 LDSET,FILES=NEWSAMP/SSAMP/REPDA.
00240 LGO.
00250 RETURN,NEWSAMP.
00260 ATTACH,SUBSET=NEWSAMP.
00270 ATTACH,DICT=DICT01.
00280 PURGE,RBSEM/NA.
00290 RETURN,RBSEM.
00300 DEFINE,RBSEM.
00310 GET,COMMAND=ISABLD1.
00320 GET,INPUT=ISABIN.
00330 CALL,ISAV2.
00340 RETURN,INPUT.
00350 RETURN,SUBSET.
READY.
```

THIS PAGE IS BEST QUALITY PRACTICABLE
FROM COPY FURNISHED TO DDC

DEFBLD1

DEFBLD1 is a procedure file used to create the file DICTO1 used by IS/ATHENA. DEFBLD1 attaches a file of data base specifications called ISADEF1 and from it creates the data base definition. This procedure does not need to be executed again unless the data base specifications should change. In that case, the file ISADEF1 must be modified and DEFBLD1 executed to recreate DICTO1. The only difference between ISADEF and ISADEF1 is the addition of commands to reflect the additional fields (factors, causes, alternatives) in each record.

To execute DEFBLD1, type the following:

```
-DEFBLD1
IS-ATHENA VER 2.3K DATE COMPILE IS  78/07/20.
TODAY'S DATE IS  12/12/78. JULIAN DATE IS        28835
? PROCESS.
DICTIONARY KEY INSERTED = SERIAL
DICTIONARY KEY INSERTED = SEQNUM
DICTIONARY KEY INSERTED = JURIS
DICTIONARY KEY INSERTED = OPAGE
DICTIONARY KEY INSERTED = OPEXPERD
DICTIN*IY KEY INSERTED = OPEXPER
DICTIONARY KEY INSERTED = OPEXPERL
DICTIONARY KEY INSERTED = RENTED
DICTIONARY KEY INSERTED = POB
DICTIONARY KEY INSERTED = FORINSTD
DICTIONARY KEY INSERTED = FORINST
DICTIONARY KEY INSERTED = FORINSTL
DICTIONARY KEY INSERTED = MFGCODE
DICTIONARY KEY INSERTED = TYPEBOATD
DICTIONARY KEY INSERTED = TYPEBOAT
DICTIONARY KEY INSERTED = TYPEBOATL
DICTIONARY KEY INSERTED = HULLMAT
DICTIONARY KEY INSERTED = PROPUL
DICTIONARY KEY INSERTED = POWER
DICTIONARY KEY INSERTED = LENGTH
DICTIONARY KEY INSERTED = YRBUILT
DICTIONARY KEY INSERTED = MONTH
DICTIONARY KEY INSERTED = DAY
DICTIONARY KEY INSERTED = YR
DICTIONARY KEY INSERTED = TIME
DICTIONARY KEY INSERTED = WATERTYPD
DICTIONARY KEY INSERTED = WATERTYP
DICTIONARY KEY INSERTED = WATERTYPL
DICTIONARY KEY INSERTED = STATE
DICTIONARY KEY INSERTED = COUNTY
DICTIONARY KEY INSERTED = DISTRICT
DICTIONARY KEY INSERTED = WEATHER
DICTIONARY KEY INSERTED = WATERCOND
DICTIONARY KEY INSERTED = WATERCON
DICTIONARY KEY INSERTED = WATERCONL
DICTIONARY KEY INSERTED = SEATEMPD
DICTIONARY KEY INSERTED = SEATEMP
DICTIONARY KEY INSERTED = SEATEMPL
```

THIS PAGE IS BEST QUALITY PRACTICABLE
FROM COPY FURNISHED TO DDC

```
DICTIONARY KEY INSERTED = WIND
DICTIONARY KEY INSERTED = VISIBIL
DICTIONARY KEY INSERTED = OPATTIMED
DICTIONARY KEY INSERTED = OPATTIME
DICTIONARY KEY INSERTED = OPATTIMEL
DICTIONARY KEY INSERTED = TYPE1D
DICTIONARY KEY INSERTED = TYPE1
DICTIONARY KEY INSERTED = TYPE1L
DICTIONARY KEY INSERTED = TYPE2
DICTIONARY KEY INSERTED = TYPE3
DICTIONARY KEY INSERTED = PFDS
DICTIONARY KEY INSERTED = PROPDAM
DICTIONARY KEY INSERTED = DROWNVIC
DICTIONARY KEY INSERTED = OTHERVIC
DICTIONARY KEY INSERTED = INJURIES
DICTIONARY KEY INSERTED = NUMBVES
DICTIONARY KEY INSERTED = CAUSE1
DICTIONARY KEY INSERTED = CAUSE2
DICTIONARY KEY INSERTED = CAUSE3
DICTIONARY KEY INSERTED = DESC1
DICTIONARY KEY INSERTED = DESC2
DICTIONARY KEY INSERTED = DESC3
DICTIONARY KEY INSERTED = DESC4
DICTIONARY KEY INSERTED = JULDATE
DICTIONARY KEY INSERTED = DAYOFWEEK
DICTIONARY KEY INSERTED = FATALS
DICTIONARY KEY INSERTED = FRACACC
DICTIONARY KEY INSERTED = RTYPE
DICTIONARY KEY INSERTED = WEIFAT
DICTIONARY KEY INSERTED = WEINJ
DICTIONARY KEY INSERTED = WEIPRO
DICTIONARY KEY INSERTED = SUMFAT
DICTIONARY KEY INSERTED = NCAUSED
DICTIONARY KEY INSERTED = NCAUSE
DICTIONARY KEY INSERTED = NCAUSEL
DICTIONARY KEY INSERTED = FACT1D
DICTIONARY KEY INSERTED = FACT1
DICTIONARY KEY INSERTED = FACT1L
DICTIONARY KEY INSERTED = FACT2D
DICTIONARY KEY INSERTED = FACT2
DICTIONARY KEY INSERTED = FACT2L
DICTIONARY KEY INSERTED = FACT3D
DICTIONARY KEY INSERTED = FACT3
DICTIONARY KEY INSERTED = FACT3L
DICTIONARY KEY INSERTED = FACT4D
DICTIONARY KEY INSERTED = FACT4
DICTIONARY KEY INSERTED = FACT4L
DICTIONARY KEY INSERTED = FACT5D
DICTIONARY KEY INSERTED = FACT5
DICTIONARY KEY INSERTED = FACT5L
DICTIONARY KEY INSERTED = FACT6D
DICTIONARY KEY INSERTED = FACT6
DICTIONARY KEY INSERTED = FACT6L
DICTIONARY KEY INSERTED = FACT7D
DICTIONARY KEY INSERTED = FACT7
DICTIONARY KEY INSERTED = FACT7L
DICTIONARY KEY INSERTED = FACT8D
DICTIONARY KEY INSERTED = FACT8
DICTIONARY KEY INSERTED = FACT8L
DICTIONARY KEY INSERTED = ALT1D
DICTIONARY KEY INSERTED = ALT1
DICTIONARY KEY INSERTED = ALT1L
DICTIONARY KEY INSERTED = ALT2D
DICTIONARY KEY INSERTED = ALT2
DIC!IONARY KEY INSERTED = ALT2L
DICTIONARY KEY INSERTED = ALT3D
DICTIONARY KEY INSERTED = ALT3
DICTIONARY KEY INSERTED = ALT3L
DICTIONARY KEY INSERTED = ALT4D
DICTIONARY KEY INSERTED = ALT4
DICTIONARY KEY INSERTED = ALT4L
DICTIONARY KEY INSERTED = ALT5D
DICTIONARY KEY INSERTED = ALT5
DICTIONARY KEY INSERTED = ALT5L
DICTIONARY KEY INSERTED = ALT6D
DICTIONARY KEY INSERTED = ALT6
DICTIONARY KEY INSERTED = ALT6L
DICTIONARY KEY INSERTED = E0
DICTIONARY KEY INSERTED = E1
DICTIONARY KEY INSERTED = E2
DICTIONARY KEY INSERTED = E3
DICTIONARY KEY INSERTED = E4
DICTIONARY KEY INSERTED = E9
DICTIONARY KEY INSERTED = I0
DICTIONARY KEY INSERTED = I1
DI8JNN*IY KEY INSERTED = I2
DICTIONARY KEY INSERTED = I3
DICTIONARY KEY INSERTED = I4
DICTIONARY KEY INSERTED = I5
DICTIONARY KEY INSERTED = I6
DICTIONARY KEY INSERTED = I9
DICTIONARY KEY INSERTED = A1
DICTIONARY KEY INSERTED = A2
DICTIONARY KEY INSERTED = A3
DICTIONARY KEY INSERTED = A4
DICTIONARY KEY INSERTED = A5
DICTIONARY KEY INSERTED = A6
DICTIONARY KEY INSERTED = A7
DICTIONARY KEY INSERTED = A8
DICTIONARY KEY INSERTED = A9
DICTIONARY KEY INSERTED = A0
DICTIONARY KEY INSERTED = W1
DICTIONARY KEY INSERTED = W2
DICTIONARY KEY INSERTED = W3
DICTIONARY KEY INSERTED = W4
DICTIONARY KEY INSERTED = W5
DICTIONARY KEY INSERTED = W6
DICTIONARY KEY INSERTED = W9
DICTIONARY KEY INSERTED = C1
DICTIONARY KEY INSERTED = C2
DICTIONARY KEY INSERTED = C3
DICTIONARY KEY INSERTED = C4
DICTIONARY KEY INSERTED = C5
DICTIONARY KEY INSERTED = C9
DICTIONARY KEY INSERTED = S1
DICTIONARY KEY INSERTED = S2
DICTIONARY KEY INSERTED = S3
DICTIONARY KEY INSERTED = S4
```

THIS PAGE IS BEST QUALITY PRACTICABLE FROM COPY FURNISHED TO DDC

THIS PAGE IS BEST QUALITY PRACTICABLE
FROM COPY FURNISHED TO DDC

```
DICTIONARY KEY INSERTED = S5
DICTIONARY KEY INSERTED = S6
DICTIONARY KEY INSERTED = S7
DICTIONARY KEY INSERTED = S8
DICTIONARY KEY INSERTED = S9
DICTIONARY KEY INSERTED = O00
DICTIONARY KEY INSERTED = O10
DICTIONARY KEY INSERTED = O11
DICTIONARY KEY INSERTED = O12
DICTIONARY KEY INSERTED = O13
DICTIONARY KEY INSERTED = O20
DICTIONARY KEY INSERTED = O21
DICTIONARY KEY INSERTED = O22
DICTIONARY KEY INSERTED = O23
DICTIONARY KEY INSERTED = O24
DICTIONARY KEY INSERTED = O30
DICTIONARY KEY INSERTED = O31
DICTIONARY KEY INSERTED = O40
DICTIONARY KEY INSERTED = O50
DICTIONARY KEY INSERTED = O51
DICTIONARY KEY INSERTED = O60
DICTIONARY KEY INSERTED = O61
DICTIONARY KEY INSERTED = O62
DICTIONARY KEY INSERTED = O63
DICTIONARY KEY INSERTED = O70
DICTIONARY KEY INSERTED = O71
DICTIONARY KEY INSERTED = O72
DICTIONARY KEY INSERTED = O73
DICTIONARY KEY INSERTED = O80
DICTIONARY KEY INSERTED = O81
DICTIONARY KEY INSERTED = O99
DICTIONARY KEY INSERTED = T00
DICTIONARY KEY INSERTED = T01
DICTIONARY KEY INSERTED = T02
DICTIONARY KEY INSERTED = T03
DICTIONARY KEY INSERTED = T04
DICTIONARY KEY INSERTED = T05
DICTIONARY KEY INSERTED = T06
DICTIONARY KEY INSERTED = T07
DICTIONARY KEY INSERTED = T08
DICTIONARY KEY INSERTED = T09
DICTIONARY KEY INSERTED = T10
DICTIONARY KEY INSERTED = T11
DICTIONARY KEY INSERTED = T12
DICTIONARY KEY INSERTED = T98
DICTIONARY KEY INSERTED = T99
DICTIONARY KEY INSERTED = D101
DICTIONARY KEY INSERTED = D102
DICTIONARY KEY INSERTED = D103
DICTIONARY KEY INSERTED = D104
DICTIONARY KEY INSERTED = D105
DICTIONARY KEY INSERTED = D106
DICTIONARY KEY INSERTED = D107
DICTIONARY KEY INSERTED = D108
DICTIONARY KEY INSERTED = D109
DICTIONARY KEY INSERTED = D110
DICTIONARY KEY INSERTED = D111
DICTIONARY KEY INSERTED = D112
DICTIONARY KEY INSERTED = D113
DICTIONARY KEY INSERTED = D114
DICTIONARY KEY INSERTED = D115
DICTIONARY KEY INSERTED = D116
DICTIONARY KEY INSERTED = D117
DICTIONARY KEY INSERTED = D118
DICTIONARY KEY INSERTED = D119
DICTIONARY KEY INSERTED = D120
DICTIONARY KEY INSERTED = D121
DICTIONARY KEY INSERTED = D122
DICTIONARY KEY INSERTED = D123
DICTIONARY KEY INSERTED = D201
DICTIONARY KEY INSERTED = D202
DICTIONARY KEY INSERTED = D203
DICTIONARY KEY INSERTED = D204
DICTIONARY KEY INSERTED = D205
DICTIONARY KEY INSERTED = D206
DICTIONARY KEY INSERTED = D207
DICTIONARY KEY INSERTED = D208
DICTIONARY KEY INSERTED = D209
DICTIONARY KEY INSERTED = D210
DICTIONARY KEY INSERTED = D211
DICTIONARY KEY INSERTED = D212
DICTIONARY KEY INSERTED = D213
DICTIONARY KEY INSERTED = D214
DICTIONARY KEY INSERTED = D215
DICTIONARY KEY INSERTED = D216
DICTIONARY KEY INSERTED = D217
DICTIONARY KEY INSERTED = D218
DICTIONARY KEY INSERTED = D219
DICTIONARY KEY INSERTED = D220
DICTIONARY KEY INSERTED = D221
DICTIONARY KEY INSERTED = D222
DICTIONARY KEY INSERTED = D223
DICTIONARY KEY INSERTED = D224
DICTIONARY KEY INSERTED = D225
DICTIONARY KEY INSERTED = D226
DICTIONARY KEY INSERTED = D227
DICTIONARY KEY INSERTED = D228
DICTIONARY KEY INSERTED = D229
DICTIONARY KEY INSERTED = D230
DICTIONARY KEY INSERTED = D231
DICTIONARY KEY INSERTED = D232
DICTIONARY KEY INSERTED = D233
DICTIONARY KEY INSERTED = D234
DICTIONARY KEY INSERTED = D235
DICTIONARY KEY INSERTED = D236
DICTIONARY KEY INSERTED = D237
DICTIONARY KEY INSERTED = D238
DICTIONARY KEY INSERTED = D239
DICTIONARY KEY INSERTED = D240
DICTIONARY KEY INSERTED = D241
DICTIONARY KEY INSERTED = D242
DICTIONARY KEY INSERTED = D243
DICTIONARY KEY INSERTED = D244
DICTIONARY KEY INSERTED = D245
DICTIONARY KEY INSERTED = D246
 *SBU JOB STEP LIMIT*
S,777
DICTIONARY KEY INSERTED = D247
DICTIONARY KEY INSERTED = D248
DICTIONARY KEY INSERTED = D249
DICTIONARY KEY INSERTED = D250
DICTIONARY KEY INSERTED = D251
```

```
DICTIONARY KEY INSERTED = D252
DICTIONARY KEY INSERTED = D253
DICTIONARY KEY INSERTED = D254
DICTIONARY KEY INSERTED = D255
DICTIONARY KEY INSERTED = D256
DICTIONARY KEY INSERTED = D257
DICTIONARY KEY INSERTED = D258
DICTIONARY KEY INSERTED = D259
DICTIONARY KEY INSERTED = D260
DICTIONARY KEY INSERTED = D261
DICTIONARY KEY INSERTED = D262
DICTIONARY KEY INSERTED = D263
DICTIONARY KEY INSERTED = D264
DICTIONARY KEY INSERTED = D265
DICTIONARY KEY INSERTED = D266
DICTIONARY KEY INSERTED = D267
DICTIONARY KEY INSERTED = D268
DICTIONARY KEY INSERTED = D269
DICTIONARY KEY INSERTED = D270
DICTIONARY KEY INSERTED = D271
DICTIONARY KEY INSERTED = D272
DICTIONARY KEY INSERTED = D273
DICTIONARY KEY INSERTED = D274
DICTIONARY KEY INSERTED = D275
DICTIONARY KEY INSERTED = D276
DICTIONARY KEY INSERTED = D277
DICTIONARY KEY INSERTED = D278
DICTIONARY KEY INSERTED = D279
DICTIONARY KEY INSERTED = D280
DICTIONARY KEY INSERTED = D281
DICTIONARY KEY INSERTED = D282
DICTIONARY KEY INSERTED = D283
DICTIONARY KEY INSERTED = D284
DICTIONARY KEY INSERTED = D285
DICTIONARY KEY INSERTED = D286
DICTIONARY KEY INSERTED = D287
DICTIONARY KEY INSERTED = D288
DICTIONARY KEY INSERTED = D289
DICTIONARY KEY INSERTED = D290
DICTIONARY KEY INSERTED = D291
DICTIONARY KEY INSERTED = D292
DICTIONARY KEY INSERTED = D293
DICTIONARY KEY INSERTED = D294
DICTIONARY KEY INSERTED = D295
DICTIONARY KEY INSERTED = D296
DICTIONARY KEY INSERTED = D297
DICTIONARY KEY INSERTED = D298
DICTIONARY KEY INSERTED = D299
DICTIONARY KEY INSERTED = D300
DICTIONARY KEY INSERTED = D301
DICTIONARY KEY INSERTED = D302
DICTIONARY KEY INSERTED = D303
DICTIONARY KEY INSERTED = D304
DICTIONARY KEY INSERTED = D305
DICTIONARY KEY INSERTED = D306
DICTIONARY KEY INSERTED = D307
DICTIONARY KEY INSERTED = D308
DICTIONARY KEY INSERTED = D309
DICTIONARY KEY INSERTED = D310
DICTIONARY KEY INSERTED = D311
DICTIONARY KEY INSERTED = D312
DICTIONARY KEY INSERTED = D313
DICTIONARY KEY INSERTED = D314
DICTIONARY KEY INSERTED = D315
DICTIONARY KEY INSERTED = D316
DICTIONARY KEY INSERTED = D317
DICTIONARY KEY INSERTED = D318
DICTIONARY KEY INSERTED = D319
DICTIONARY KEY INSERTED = D320
DICTIONARY KEY INSERTED = D321
DICTIONARY KEY INSERTED = D322
DICTIONARY KEY INSERTED = D323
DICTIONARY KEY INSERTED = D324
DICTIONARY KEY INSERTED = D325
DICTIONARY KEY INSERTED = D401
DICTIONARY KEY INSERTED = D402
DICTIONARY KEY INSERTED = D403
DICTIONARY KEY INSERTED = D404
DICTIONARY KEY INSERTED = D405
DICTIONARY KEY INSERTED = D406
DICTIONARY KEY INSERTED = D407
DICTIONARY KEY INSERTED = D408
DICTIONARY KEY INSERTED = D409
DICTIONARY KEY INSERTED = D410
DICTIONARY KEY INSERTED = D411
DICTIONARY KEY INSERTED = D412
DICTIONARY KEY INSERTED = D413
DICTIONARY KEY INSERTED = D414
DICTIONARY KEY INSERTED = D415
DICTIONARY KEY INSERTED = D416
DICTIONARY KEY INSERTED = D417
DICTIONARY KEY INSERTED = D418
DICTIONARY KEY INSERTED = D419
DICTIONARY KEY INSERTED = D420
DICTIONARY KEY INSERTED = D421
DICTIONARY KEY INSERTED = D422
DICTIONARY KEY INSERTED = D423
DICTIONARY KEY INSERTED = D424
DICTIONARY KEY INSERTED = D425
DICTIONARY KEY INSERTED = D426
DICTIONARY KEY INSERTED = D427
DICTIONARY KEY INSERTED = D428
DICTIONARY KEY INSERTED = D429
DICTIONARY KEY INSERTED = D430
DICTIONARY KEY INSERTED = D431
DICTIONARY KEY INSERTED = D432
DICTIONARY KEY INSERTED = D433
DICTIONARY KEY INSERTED = D434
DICTIONARY KEY INSERTED = D435
DICTIONARY KEY INSERTED = D436
DICTIONARY KEY INSERTED = D501
DICTIONARY KEY INSERTED = D502
DICTIONARY KEY INSERTED = D503
DICTIONARY KEY INSERTED = D504
TED = D505
DICTIONARY KEY INSERTED = D506
DICTIONARY KEY INSERTED = D507
DICTIONARY KEY INSERTED = D508
DICTIONARY KEY INSERTED = D509
DICTIONARY KEY INSERTED = D510
DICTIONARY KEY INSERTED = D511
DICTIONARY KEY INSERTED = D512
```

THIS PAGE IS BEST QUALITY PRACTICABLE
FROM COPY FURNISHED TO DDC

THIS PAGE IS BEST QUALITY PRACTICABLE
FROM COPY FURNISHED TO DDC

DICTIONARY KEY INSERTED = D513
DICTIONARY KEY INSERTED = D601
DICTIONARY KEY INSERTED = D602
DICTIONARY KEY INSERTED = D603
DICTIONARY KEY INSERTED = D604
DICTIONARY KEY INSERTED = D605
DICTIONARY KEY INSERTED = D606
DICTIONARY KEY INSERTED = D607
DICTIONARY KEY INSERTED = D701
DICTIONARY KEY INSERTED = D702
DICTIONARY KEY INSERTED = D703
DICTIONARY KEY INSERTED = D704
DICTIONARY KEY INSERTED = D705
DICTIONARY KEY INSERTED = D706
DICTIONARY KEY INSERTED = D707
DICTIONARY KEY INSERTED = D708
DICTIONARY KEY INSERTED = D709
DICTIONARY KEY INSERTED = D710
DICTIONARY KEY INSERTED = D711
DICTIONARY KEY INSERTED = D712
DICTIONARY KEY INSERTED = D713
DICTIONARY KEY INSERTED = D714
DICTIONARY KEY INSERTED = D715
DICTIONARY KEY INSERTED = D716
DICTIONARY KEY INSERTED = D717
DICTIONARY KEY INSERTED = D718
DICTIONARY KEY INSERTED = D801
DICTIONARY KEY INSERTED = D802
DICTIONARY KEY INSERTED = D803
DICTIONARY KEY INSERTED = D804
DICTIONARY KEY INSERTED = D805
DICTIONARY KEY INSERTED = D806
DICTIONARY KEY INSERTED = D807
DICTIONARY KEY INSERTED = D808
DICTIONARY KEY INSERTED = D809
DICTIONARY KEY INSERTED = D810
DICTIONARY KEY INSERTED = D811
DICTIONARY KEY INSERTED = B001
DICTIONARY KEY INSERTED = B002
DICTIONARY KEY INSERTED = B003
DICTIONARY KEY INSERTED = B004
DICTIONARY KEY INSERTED = B005
DICTIONARY KEY INSERTED = B006
DICTIONARY KEY INSERTED = B007
DICTIONARY KEY INSERTED = B008
DICTIONARY KEY INSERTED = B009
DICTIONARY KEY INSERTED = B010
DICTIONARY KEY INSERTED = B011
DICTIONARY KEY INSERTED = B012
DICTIONARY KEY INSERTED = B013
DICTIONARY KEY INSERTED = B014
DICTIONARY KEY INSERTED = B015
DICTIONARY KEY INSERTED = B016
DICTIONARY KEY INSERTED = B017
DICTIONARY KEY INSERTED = B018
DICTIONARY KEY INSERTED = B019
DICTIONARY KEY INSERTED = B020
DICTIONARY KEY INSERTED = B021
DICTIONARY KEY INSERTED = B022
DICTIONARY KEY INSERTED = B023
DICTIONARY KEY INSERTED = B024
DICTIONARY KEY INSERTED = B025
DICTIONARY KEY INSERTED = B026
DICTIONARY KEY INSERTED = B027
DICTIONARY KEY INSERTED = B028
DICTIONARY KEY INSERTED = B029
DICTIONARY KEY INSERTED = B030
DICTIONARY KEY INSERTED = B031
DICTIONARY KEY INSERTED = B032
DICTIONARY KEY INSERTED = B033
DICTIONARY KEY INSERTED = B034
DICTIONARY KEY INSERTED = B035
DICTIONARY KEY INSERTED = B036
DICTIONARY KEY INSERTED = B037
DICTIONARY KEY INSERTED = B038
DICTIONARY KEY INSERTED = B039
DICTIONARY KEY INSERTED = B040
DICTIONARY KEY INSERTED = B041
DICTIONARY KEY INSERTED = B042
DICTIONARY KEY INSERTED = B043
DICTIONARY KEY INSERTED = B044
DICTIONARY KEY INSERTED = B045
DICTIONARY KEY INSERTED = B046
DICTIONARY KEY INSERTED = B047
DICTIONARY KEY INSERTED = B048
DICTIONARY KEY INSERTED = B049
DICTIONARY KEY INSERTED = B050
DICTIONARY KEY INSERTED = B051
DICTIONARY KEY INSERTED = B052
DICTIONARY KEY INSERTED = B053
DICTIONARY KEY INSERTED = B054
DICTIONARY KEY INSERTED = B055
DICTIONARY KEY INSERTED = B056
DICTIONARY KEY INSERTED = B057
DICTIONARY KEY INSERTED = B058
DICTIONARY KEY INSERTED = B059
DICTIONARY KEY INSERTED = B060
DICTIONARY KEY INSERTED = B061
DICTIONARY KEY INSERTED = B062
DICTIONARY KEY INSERTED = B063
DICTIONARY KEY INSERTED = B064
DICTIONARY KEY INSERTED = B065
DICTIONARY KEY INSERTED = B066
DICTIONARY KEY INSERTED = B067
DICTIONARY KEY INSERTED = B068
DICTIONARY KEY INSERTED = B069
DICTIONARY KEY INSERTED = B070
DICTIONARY KEY INSERTED = B071
DICTIONARY KEY INSERTED = B072
DICTIONARY KEY INSERTED = B073
DICTIONARY KEY INSERTED = B074
DICTIONARY KEY INSERTED = B075
DICTIONARY KEY INSERTED = B076
DICTIONARY KEY INSERTED = B077
DICTIONARY KEY INSERTED = B078
DICTIONARY KEY INSERTED = B079
DICTIONARY KEY INSERTED = B080
DICTIONARY KEY INSERTED = B081

DICTIONARY KEY INSERTED = B082
DICTIONARY KEY INSERTED = B083
DICTIONARY KEY INSERTED = B084
DICTIONARY KEY INSERTED = B085
DICTIONARY KEY INSERTED = B086
DICTIONARY KEY INSERTED = B087
DICTIONARY KEY INSERTED = B088
DICTIONARY KEY INSERTED = B089
DICTIONARY KEY INSERTED = B090
DICTIONARY KEY INSERTED = B091
DICTIONARY KEY INSERTED = B092
DICTIONARY KEY INSERTED = B093
DICTIONARY KEY INSERTED = B094
DICTIONARY KEY INSERTED = B095
DICTIONARY KEY INSERTED = B096
DICTIONARY KEY INSERTED = B097
DICTIONARY KEY INSERTED = B098
DICTIONARY KEY INSERTED = B099
DICTIONARY KEY INSERTED = B100
DICTIONARY KEY INSERTED = B101
DICTIONARY KEY INSERTED = B102
DICTIONARY KEY INSERTED = B103
DICTIONARY KEY INSERTED = B104
DICTIONARY KEY INSERTED = B105
DICTIONARY KEY INSERTED = B106
DICTIONARY KEY INSERTED = B107
DICTIONARY KEY INSERTED = B108
DICTIONARY KEY INSERTED = B109
DICTIONARY KEY INSERTED = B110
DICTIONARY KEY INSERTED = B111
DICTIONARY KEY INSERTED = B112
DICTIONARY KEY INSERTED = B113
DICTIONARY KEY INSERTED = B114
DICTIONARY KEY INSERTED = B115
DICTIONARY KEY INSERTED = B116
DICTIONARY KEY INSERTED = B117
DICTIONARY KEY INSERTED = B118
DICTIONARY KEY INSERTED = B119
DICTIONARY KEY INSERTED = B120
DICTIONARY KEY INSERTED = B121
DICTIONARY KEY INSERTED = B122
DICTIONARY KEY INSERTED = B123
DICTIONARY KEY INSERTED = B124
DICTIONARY KEY INSERTED = B125
DICTIONARY KEY INSERTED = B126
DICTIONARY KEY INSERTED = B127
DICTIONARY KEY INSERTED = B128
DICTIONARY KEY INSERTED = B129
DICTIONARY KEY INSERTED = B130
DICTIONARY KEY INSERTED = B131
DICTIONARY KEY INSERTED = B132
DICTIONARY KEY INSERTED = B133
DICTIONARY KEY INSERTED = B134
DICTIONARY KEY INSERTED = B135
DICTIONARY KEY INSERTED = B136
DICTIONARY KEY INSERTED = B137
DICTIONARY KEY INSERTED = B138
DICTIONARY KEY INSERTED = B139
DICTIONARY KEY INSERTED = B140
DICTIONARY KEY INSERTED = B141
DICTIONARY KEY INSERTED = B142
DICTIONARY KEY INSERTED = B143
DICTIONARY KEY INSERTED = B144
DICTIONARY KEY INSERTED = B145
DICTIONARY KEY INSERTED = B146
DICTIONARY KEY INSERTED = B147
DICTIONARY KEY INSERTED = B148
DICTIONARY KEY INSERTED = B149
DICTIONARY KEY INSERTED = B150
DICTIONARY KEY INSERTED = B151
DICTIONARY KEY INSERTED = B152
DICTIONARY KEY INSERTED = B153
DICTIONARY KEY INSERTED = B154
DICTIONARY KEY INSERTED = B155
DICTIONARY KEY INSERTED = B156
DICTIONARY KEY INSERTED = B157
DICTIONARY KEY INSERTED = B158
DICTIONARY KEY INSERTED = B159
DICTIONARY KEY INSERTED = B160
DICTIONARY KEY INSERTED = B161
DICTIONARY KEY INSERTED = B162
DICTIONARY KEY INSERTED = B163
DICTIONARY KEY INSERTED = B164
DICTIONARY KEY INSERTED = B165
DICTIONARY KEY INSERTED = B166
DICTIONARY KEY INSERTED = B167
DICTIONARY KEY INSERTED = B168
DICTIONARY KEY INSERTED = B169
DICTIONARY KEY INSERTED = B170
DICTIONARY KEY INSERTED = B171
DICTIONARY KEY INSERTED = B172
DICTIONARY KEY INSERTED = B173
DICTIONARY KEY INSERTED = B174
DICTIONARY KEY INSERTED = B175
DICTIONARY KEY INSERTED = B176
DICTIONARY KEY INSERTED = B177
DICTIONARY KEY INSERTED = B178
DICTIONARY KEY INSERTED = B179
DICTIONARY KEY INSERTED = B180
DICTIONARY KEY INSERTED = B181
DICTIONARY KEY INSERTED = B182
DICTIONARY KEY INSERTED = B183
DICTIONARY KEY INSERTED = B184
DICTIONARY KEY INSERTED = B185
DICTIONARY KEY INSERTED = B186
DICTIONARY KEY INSERTED = B187
DICTIONARY KEY INSERTED = B188
DICTIONARY KEY INSERTED = B189
DICTIONARY KEY INSERTED = B190
DICTIONARY KEY INSERTED = B191
DICTIONARY KEY INSERTED = B192
DICTIONARY KEY INSERTED = B193
DICTIONARY KEY INSERTED = B194
DICTIONARY KEY INSERTED = B195
DICTIONARY KEY INSERTED = B196
DICTIONARY KEY INSERTED = B197
DICTIONARY KEY INSERTED = B198
DICTIONARY KEY INSERTED = B199

THIS PAGE IS BEST QUALITY PRACTICABLE
FROM COPY FURNISHED TO DDC

THIS PAGE IS BEST QUALITY PRACTICABLE
FROM COPY FURNISHED TO DDC

DICTIONARY KEY INSERTED = B200
DICTIONARY KEY INSERTED = B201
DICTIONARY KEY INSERTED = B202
DICTIONARY KEY INSERTED = B203
DICTIONARY KEY INSERTED = B204
DICTIONARY KEY INSERTED = B205
DICTIONARY KEY INSERTED = B206
DICTIONARY KEY INSERTED = B207
DICTIONARY KEY INSERTED = B208
DICTIONARY KEY INSERTED = B209
DICTIONARY KEY INSERTED = B210
DICTIONARY KEY INSERTED = B211
DICTIONARY KEY INSERTED = B212
DICTIONARY KEY INSERTED = B213
DICTIONARY KEY INSERTED = B214
DICTIONARY KEY INSERTED = B215
DICTIONARY KEY INSERTED = B216
DICTIONARY KEY INSERTED = B217
DICTIONARY KEY INSERTED = B218
DICTIONARY KEY INSERTED = B219
DICTIONARY KEY INSERTED = B220
DICTIONARY KEY INSERTED = B221
DICTIONARY KEY INSERTED = B222
DICTIONARY KEY INSERTED = B223
DICTIONARY KEY INSERTED = B224
DICTIONARY KEY INSERTED = B225
DICTIONARY KEY INSERTED = B226
DICTIONARY KEY INSERTED = B227
DICTIONARY KEY INSERTED = B228
DICTIONARY KEY INSERTED = B229
DICTIONARY KEY INSERTED = B230
DICTIONARY KEY INSERTED = B231
DICTIONARY KEY INSERTED = B232
DICTIONARY KEY INSERTED = B233
DICTIONARY KEY INSERTED = B234
DICTIONARY KEY INSERTED = B235
DICTIONARY KEY INSERTED = B236
DICTIONARY KEY INSERTED = B237
DICTIONARY KEY INSERTED = B238
DICTIONARY KEY INSERTED = B239
DICTIONARY KEY INSERTED = B240
DICTIONARY KEY INSERTED = B241
DICTIONARY KEY INSERTED = B242
DICTIONARY KEY INSERTED = B243
DICTIONARY KEY INSERTED = B244
DICTIONARY KEY INSERTED = B245
DICTIONARY KEY INSERTED = B246
DICTIONARY KEY INSERTED = B247
DICTIONARY KEY INSERTED = B248
DICTIONARY KEY INSERTED = B249
DICTIONARY KEY INSERTED = B250
DICTIONARY KEY INSERTED = B251
DICTIONARY KEY INSERTED = B252
DICTIONARY KEY INSERTED = B253
DICTIONARY KEY INSERTED = B254
DICTIONARY KEY INSERTED = B255
DICTIONARY KEY INSERTED = B256
DICTIONARY KEY INSERTED = B257
DICTIONARY KEY INSERTED = B258
DICTIONARY KEY INSERTED = B259
DICTIONARY KEY INSERTED = B260
DICTIONARY KEY INSERTED = B261
DICTIONARY KEY INSERTED = B262
DICTIONARY KEY INSERTED = B263
DICTIONARY KEY INSERTED = B264
DICTIONARY KEY INSERTED = B265
DICTIONARY KEY INSERTED = B266
DICTIONARY KEY INSERTED = B267
DICTIONARY KEY INSERTED = B268
DICTIONARY KEY INSERTED = B269
DICTIONARY KEY INSERTED = B270
DICTIONARY KEY INSERTED = B271
DICTIONARY KEY INSERTED = B272
DICTIONARY KEY INSERTED = B273
DICTIONARY KEY INSERTED = B274
DICTIONARY KEY INSERTED = B275
DICTIONARY KEY INSERTED = B276
DICTIONARY KEY INSERTED = B277
DICTIONARY KEY INSERTED = B278
DICTIONARY KEY INSERTED = B279
DICTIONARY KEY INSERTED = B280
DICTIONARY KEY INSERTED = B281
DICTIONARY KEY INSERTED = B282
DICTIONARY KEY INSERTED = B283
DICTIONARY KEY INSERTED = B284
DICTIONARY KEY INSERTED = B285
DICTIONARY KEY INSERTED = B286
DICTIONARY KEY INSERTED = B287
DICTIONARY KEY INSERTED = B288
DICTIONARY KEY INSERTED = B289
DICTIONARY KEY INSERTED = B290
DICTIONARY KEY INSERTED = B291
DICTIONARY KEY INSERTED = B292
DICTIONARY KEY INSERTED = B293
DICTIONARY KEY INSERTED = B294
DICTIONARY KEY INSERTED = B295
DICTIONARY KEY INSERTED = B296
DICTIONARY KEY INSERTED = B297
DICTIONARY KEY INSERTED = B298
DICTIONARY KEY INSERTED = B299
DICTIONARY KEY INSERTED = B300
DICTIONARY KEY INSERTED = B301
DICTIONARY KEY INSERTED = B302
DICTIONARY KEY INSERTED = B303
DICTIONARY KEY INSERTED = B304
DICTIONARY KEY INSERTED = B305
DICTIONARY KEY INSERTED = B306
DICTIONARY KEY INSERTED = B307
DICTIONARY KEY INSERTED = B308
DICTIONARY KEY INSERTED = B309
DICTIONARY KEY INSERTED = B310
DICTIONARY KEY INSERTED = B311
DICTIONARY KEY INSERTED = B312
DICTIONARY KEY INSERTED = B313
DICTIONARY KEY INSERTED = B314
DICTIONARY KEY INSERTED = B315
DICTIONARY KEY INSERTED = B316
DICTIONARY KEY INSERTED = B317
DICTIONARY KEY INSERTED = B318
DICTIONARY KEY INSERTED = B319

```
DICTIONARY KEY INSERTED = B320
DICTIONARY KEY INSERTED = B321
DICTIONARY KEY INSERTED = B322
DICTIONARY KEY INSERTED = B323
DICTIONARY KEY INSERTED = B324
DICTIONARY KEY INSERTED = B325
DICTIONARY KEY INSERTED = B326
DICTIONARY KEY INSERTED = B327
DICTIONARY KEY INSERTED = B328
DICTIONARY KEY INSERTED = B329
DICTIONARY KEY INSERTED = B330
DICTIONARY KEY INSERTED = B331
DICTIONARY KEY INSERTED = B332
DICTIONARY KEY INSERTED = B333
DICTIONARY KEY INSERTED = B334
DICTIONARY KEY INSERTED = B335
DICTIONARY KEY INSERTED = B336
DICTIONARY KEY INSERTED = B337
DICTIONARY KEY INSERTED = B338
DICTIONARY KEY INSERTED = B339
DICTIONARY KEY INSERTED = B340
DICTIONARY KEY INSERTED = B341
DICTIONARY KEY INSERTED = B342
DICTIONARY KEY INSERTED = B343
DICTIONARY KEY INSERTED = B344
DICTIONARY KEY INSERTED = B345
DICTIONARY KEY INSERTED = B346
DICTIONARY KEY INSERTED = B347
DICTIONARY KEY INSERTED = B348
DICTIONARY KEY INSERTED = B349
DICTIONARY KEY INSERTED = B350
DICTIONARY KEY INSERTED = B351
DICTIONARY KEY INSERTED = B352
DICTIONARY KEY INSERTED = B353
DICTIONARY KEY INSERTED = B354
DICTIONARY KEY INSERTED = B355
DICTIONARY KEY INSERTED = B356
DICTIONARY KEY INSERTED = B357
DICTIONARY KEY INSERTED = B358
DICTIONARY KEY INSERTED = B359
DICTIONARY KEY INSERTED = B360
DICTIONARY KEY INSERTED = B361
DICTIONARY KEY INSERTED = B362
DICTIONARY KEY INSERTED = B363
DICTIONARY KEY INSERTED = B364
DICTIONARY KEY INSERTED = B365
DICTIONARY KEY INSERTED = B366
DICTIONARY KEY INSERTED = B367
DICTIONARY KEY INSERTED = B368
DICTIONARY KEY INSERTED = B369
DICTIONARY KEY INSERTED = B370
DICTIONARY KEY INSERTED = B371
DICTIONARY KEY INSERTED = B372
DICTIONARY KEY INSERTED = B373
DICTIONARY KEY INSERTED = B374
DICTIONARY KEY INSERTED = B375
DICTIONARY KEY INSERTED = B376
DICTIONARY KEY INSERTED = B377
DICTIONARY KEY INSERTED = B378
DICTIONARY KEY INSERTED = B379
DICTIONARY KEY INSERTED = B380
DICTIONARY KEY INSERTED = B381
DICTIONARY KEY INSERTED = B382
DICTIONARY KEY INSERTED = B383
DICTIONARY KEY INSERTED = B384
DICTIONARY KEY INSERTED = B385
DICTIONARY KEY INSERTED = B386
DICTIONARY KEY INSERTED = B387
DICTIONARY KEY INSERTED = B388
DICTIONARY KEY INSERTED = B389
DICTIONARY KEY INSERTED = B390
DICTIONARY KEY INSERTED = B391
DICTIONARY KEY INSERTED = B392
DICTIONARY KEY INSERTED = B393
DICTIONARY KEY INSERTED = B394
DICTIONARY KEY INSERTED = B395
DICTIONARY KEY INSERTED = B396
DICTIONARY KEY INSERTED = B397
DICTIONARY KEY INSERTED = B398
DICTIONARY KEY INSERTED = B399
DICTIONARY KEY INSERTED = B400
DICTIONARY KEY INSERTED = B401
DICTIONARY KEY INSERTED = B402
DICTIONARY KEY INSERTED = B403
DICTIONARY KEY INSERTED = B404
DICTIONARY KEY INSERTED = B405
DICTIONARY KEY INSERTED = B406
DICTIONARY KEY INSERTED = B407
DICTIONARY KEY INSERTED = B408
DICTIONARY KEY INSERTED = B409
DICTIONARY KEY INSERTED = B410
DICTIONARY KEY INSERTED = B411
DICTIONARY KEY INSERTED = B412
DICTIONARY KEY INSERTED = B413
DICTIONARY KEY INSERTED = B414
DICTIONARY KEY INSERTED = B415
DICTIONARY KEY INSERTED = B416
DICTIONARY KEY INSERTED = B417
DICTIONARY KEY INSERTED = B418
DICTIONARY KEY INSERTED = B419
DICTIONARY KEY INSERTED = B420
DICTIONARY KEY INSERTED = B421
DICTIONARY KEY INSERTED = B422
DICTIONARY KEY INSERTED = B423
DICTIONARY KEY INSERTED = B424
DICTIONARY KEY INSERTED = B425
DICTIONARY KEY INSERTED = F01
DICTIONARY KEY INSERTED = F02
DICTIONARY KEY INSERTED = F03
DICTIONARY KEY INSERTED = F04
DICTIONARY KEY INSERTED = F05
DICTIONARY KEY INSERTED = F06
DICTIONARY KEY INSERTED = F07
DICTIONARY KEY INSERTED = F99
? FINISH.
ATHENA IS FINISHED
READY.
ENQUIRE,S

 SBU ACCUMULATOR.

   SBU        602.429 UNTS.
READY.
```

THIS PAGE IS BEST QUALITY PRACTICABLE
FROM COPY FURNISHED TO DDC

PHASE5

PHASE5 is a procedure file that executes an SPSS run on the original SPSS system file (SB76FL) to retrieve and store the variable list, variable labels, value labels, missing values and print formats in a file called FILINFO. This information is necessary to create a new SPSS system file for the sample data cases. However, the new system file that is to be created has additional variables in it (cause, factors, alternatives). FILINFO, therefore, has to be modified to reflect these additional variables. Therefore following PHASE5, FILINFO must be edited to create SPSSDIR. If the format of the original SPSS system file does not change from year to year, then PHASE5 will not need to be rerun since the current version of SPSSDIR may be used.

To execute PHASE5, type the following:

```
-PHASE5

 SPSS/ONLINE V7.0/NOS

 USE AN SPSS SYSTEM FILE THIS RUN
 ENTER FILE NAME
 USE A RAW DATA FILE THIS RUN
 AUTO-MODE.
 ENTERING SPSS.
 SPSS/ONLINE AUTO-MODE

 USED  -     24 SBUS


1THE FILE THAT HAS JUST BEEN CREATED
          "FILINFO"
 MUST NOW BE EDITED BY MEANS OF "XEDIT"
 AND REPLACED AS
          "SPSSDIR"
 IN ORDER TO BE USED BY PHASE6.
READY.
```

Listings of PHASE5, INFOIN and SPIN follow.

```
OLD,PHASE5
READY.
LNH
00100 PURGE,FILINFO/NA.
00110 DEFINE,BCDOUT=FILINFO.
00120 ATTACH,GTFILE=SB76FL.
00130 REWIND,GTFILE.
00140 GET,TEMP=INFOIN.
00150 GET,INPUT=SPIN.
00160 CALL,SPSS.
00170 RETURN,INPUT.
00180 GET,COMENTS.
00190 COPYSBF,COMENTS.
READY.
```

```
OLD,INFOIN
READY.
LNH
GET FILE        SB76FL
RUN NAME        WRITE FILEINFO
WRITE FILEINFO  VARIABLES=ALL/ALL/
READY.
```

```
OLD,SPIN
READY.
LNH
YES
GTFILE
NO
SREAD TEMP
PAGE 9999
EXECUTE SPOUT BATCH
END
READY.
```

PHASE6

PHASE6 is a procedure file that creates a new SPSS system file called NEW76SP from the sequential file NEWSAMP and the variable descriptions contained in SPSSDIR. The SPSS output is written to a file called SPOUT and saved on disk. The computer support analyst may either list SPOUT at his/her terminal by executing the following:

```
ATTACH,SPOUT
LIST,F=SPOUT
```

OR

may dispose SPOUT to a remote batch terminal for printing. To dispose the file, he/she should execute the following:

```
ATTACH,SPOUT
COPYBF,SPOUT,SEND
DISPOSE,SEND=PR/EI=XXXXXX
```

where XXXXXX is the username the analyst used when first logging into the system.

To execute PHASE6, type the following.

```
-PHASE6

 SPSS/ONLINE V7.0/NOS

  USE AN SPSS SYSTEM FILE THIS RUN
 USE A RAW DATA FILE THIS RUN
 ENTER FILE NAME
 AUTO-MODE.
 ENTERING SPSS.
 SPSS/ONLINE AUTO-MODE

  USED  -     27 SBUS

READY.
```

Listings of PHASE6, SPSSIN follow. See Attachment A for listing of SPSSDIR.

```
OLD,PHASE6
READY.
LNH
00100 ATTACH,NEWSAMP.
00110 PURGE,SPOUT/NA.
00120 PURGE,NEW76SP/NA.
00130 RETURN,NEW76SP.
00140 DEFINE,SVFILE=NEW76SP.
00150 DEFINE,SPOUT.
00160 GET,SPSSDIR.
00165 GET,INPUT=SPSSIN.
00170 CALL,SPSS.
00175 RETURN,INPUT.
READY.
```

```
OLD,SPSSIN
READY.
LNH
NO
YES
NEWSAMP
SREAD SPSSDIR
PAGE 9999
PARAM RL=180
EXECUTE SPOUT
END
READY.
```

PHASE7

PHASE7 is a procedure file that writes a sequential data file out of the IS/ATHENA data base and from this uses a COBOL program to produce the second report. This report also contains the scenario information key-punched earlier and saved on the disk file SCENARO. This report consists of one page per record in the sample data base.

To execute PHASE7, type the following.

```
-PHASE7
IS-ATHENA VER 2.0K DATE COMPILE IS  78/07/20.
TODAY'S DATE IS  12/12/78. JULIAN DATE IS       28835
PROCESS.

 ~ATHENA IS FINISHED
READY.
```

Listing of PHASE7, ISBWRYT and ISABIN follow.

```
OLD,PHASE7
READY.
LNH
00100 PURGE,SUBSET1/NA.
00110 DEFINE,SUBSET=SUBSET1.
00120 ATTACH,DICT=DICT01.
00130 ATTACH,RBSEM.
00140 GET,COMMAND=ISBWRYT.
00150 GET,INPUT=ISABIN.
00170 CALL,ISAV2.
00180 RETURN,INPUT.
00190 RETURN,SUBSET.
00200 ATTACH,DISK1=SUBSET1.
00210 GET,PROGBIN.
00220 ATTACH,SCENARO.
00230 FILE,SCENARO,BT=C,RT=Z,FL=80,BFS=2600.
00240 FILE,DISK1,BT=C,RT=Z,FL=1004,BFS=6000.
00250 LDSET,FILES=SCENARO/DISK1.
00260 PROGBIN.
00270 REWIND,DISK2.
00280 DISPOSE,DISK2=PR/EI=X0712DC.
READY.
```

```
OLD,ISABIN
READY.
LNH
PROCESS.
READY.
```

```
OLD,ISBWRYT
READY.
LNH
RECORD,173,RBSEM,9.
DICTIONARY.
SPACING,0.
SUBSIZE,1004.
SUBSET,SERIAL,SEQNUM,JURIS,OPAGE,OPEXPERL,RENTED,
POB,FORINSTL,MFGCODE,TYPEBOATL,HULLMAT,PROPUL,POWER,
LENGTH,YRBUILT,MONTH,DAY,YR,TIME,WATERTYPL,STATE,
COUNTY,DISTRICT,WEATHER,WATERCONL,SEATEMPL,WIND,VISIBIL,
OPATTIMEL,TYPE1L,TYPE2,TYPE3,PFDS,PROPDAM,DROWNVIC,
OTHERVIC,INJURIES,NUMBVES,CAUSE1,CAUSE2,CAUSE3,DESC1,
DESC2,DESC3,DESC4,JULDATE,DAYOFWEEK,FATALS,FRACACC,RTYPE,
NCAUSEL,FACT1L,FACT2L,FACT3L,FACT4L,FACT5L,FACT6L,FACT7L,FACT8L,
ALT1L,ALT2L,ALT3L,ALT4L,ALT5L,ALT6L,
WHERE,SERIAL>=00000.
FINISH.
READY.
```

PHASE8

PHASE8 is a procedure file used to perform an SPSS BREAKDOWN for TYPE vs. FRACACC, FATALS, INJURIES, PROPDAM, SUMFAT. Output from this SPSS procedure also is written on the file SPOUT and may be printed as described in PHASE6.

To execute PHASE8, type the following.

```
-PHASE8

 SPSS/ONLINE V7.0/NOS

 USE AN SPSS SYSTEM FILE THIS RUN
 ENTER FILE NAME
 USE A RAW DATA FILE THIS RUN
 AUTO-MODE.
 ENTERING SPSS.
 SPSS/ONLINE AUTO-MODE

 USED  -     11 SBUS

READY.
```

Listings of PHASE8 and COM8A follow.

```
OLD,PHASE8
READY.
LNH
00100 PURGE,SPOUT/NA.
00110 DEFINE,SPOUT.
00120 ATTACH,GTFILE=NEW76SP.
00130 GET,TEMP=COM8A.
00140 GET,INPUT=SPIN.
00150 CALL,SPSS.
00160 RETURN,INPUT.
00170 REWIND,SPOUT.
00180 COPYBF,SPOUT,SEND.
00190 DISPOSE,SEND=PR/EI=X0712DC
READY.
```

```
OLD,COM8A
READY.
LNH
GET FILE        NEW76SP
RUN NAME        TYPE ANALYSIS(PHASE8)
BREAKDOWN       VARIABLES=FRACACC(LO,HI)/FATALS(LO,HI)/
                INJURIES(LO,HI)/SUMFAT(0,12)/
                PROPDAM(LO,HI)/TYPE1(1,12)/
                TABLES=FRACACC,FATALS,INJURIES,PROPDAM BY TYPE1/
                FRACACC BY TYPE1 BY SUMFAT
FINISH
READY.
```

PHASE9

PHASE9 is a procedure file used to execute an SPSS BREAKDOWN for

CAUSE VS. FRACACC, WEIFAT, WEINJ, WEIPRO, SUMFAT

for a given TYPE. This TYPE may change from year to year or run to run and will require that the file COM9A be modified to make that change.

Output from the SPSS procedure is written to file SPOUT and may be printed as in PHASE6.

To execute PHASE9, type the following:

```
-PHASE9

 SPSS/ONLINE V7.0/NOS

 USE AN SPSS SYSTEM FILE THIS RUN
 ENTER FILE NAME
 USE A RAW DATA FILE THIS RUN
 AUTO-MODE.
 ENTERING SPSS.


SPSS/ONLINE AUTO-MODE

USED  -      9 SBUS
```

Listings of PHASE9 and COM9A follow.

```
OLD,PHASE9
READY.
LNH
00100 PURGE,SPOUT/NA.
00110 DEFINE,SPOUT.
00120 ATTACH,GTFILE=NEW76SP.
00130 GET,TEMP=COM9A.
00140 GET,INPUT=SPIN.
00150 CALL,SPSS.
00160 RETURN,INPUT.
00170 REWIND,SPOUT.
00180 COPYBF,SPOUT,SEND.
00190 DISPOSE,SEND=PR/EI=X0712DC.
READY.
```

```
OLD,COM9A
READY.
LNH
GET FILE        NEW76SP
RUN NAME        INITIATOR ANALYSIS(PHASE9)
SELECT IF       (TYPE1 EQ 12)
BREAKDOWN       TABLES=FRACACC,WEIFAT,WEINJ,WEIPRO BY NCAUSE /
                FRACACC BY NCAUSE BY SUMFAT
FINISH
READY.
```

PHASE10

PHASE10 is a procedure file used to execute an SPSS BREAKDOWN for

ASSOCIATED FACTORS VS. FRACACC, WEIFAT, WEINJ, WEIPRO, SUMFAT

for a given TYPE and CAUSE. TYPE and CAUSE may change from run to run and thus may require that COM10A be modified to make that change.

Output from the SPSS procedure is written to file SPOUT and may be printed as in PHASE6.

To execute PHASE10, type the following.

```
-PHASE10

  SPSS/ONLINE V7.0/NOS

  USE AN SPSS SYSTEM FILE THIS RUN
  ENTER FILE NAME
  USE A RAW DATA FILE THIS RUN
  AUTO-MODE.
  ENTERING SPSS.
  SPSS/ONLINE AUTO-MODE

  USED  -      17 SBUS

READY.
```

Listings of PHASE10 and COM10A follow.

```
OLD,PHASE10
READY.
LNH
00100 PURGE,SPOUT/NA.
00110 DEFINE,SPOUT.
00120 ATTACH,G1FILE=NEW76SP.
00130 GET,TEMP=COM10A.
00140 GET,INPUT=SPIN.
00150 CALL,SPSS.
00160 RETURN,INPUT.
00170 REWIND,SPOUT.
00180 COPYBF,SPOUT,SEND.
00190 DISPOSE,SEND=PR/EI=X0712DC.
READY.
```

```
OLD,COM10A
READY.
LNH
GET FILE        NEW76SP
RUN NAME        INITIATOR ANALYSIS(PHASE10)
SELECT IF       (TYPE1 EQ 12 AND ( NCAUSE EQ 411 OR NCAUSE EQ 418))
BREAKDOWN       TABLES=FRACACC WEIFAT WEINJ WEIPRO BY
                NFACT1 TO NFACT8/
                FRACACC BY NFACT1 TO NFACT8 BY SUMFAT
FINISH
READY.
```

AD-A071 397 WYLE LABS HUNTSVILLE ALA F/G 13/10
RECREATIONAL BOATING SAFETY EDUCATION METHODOLOGY (RBSEM). (U)
APR 79 E SAGER, K GEISSLER, K REDICK, S COHEN DOT-CG-73433-A
UNCLASSIFIED MSR-79-01 USCG-D-37-79 NL

3 OF 4

AD
A071397

PHASE11

PHASE11 is a procedure file used to execute an SPSS CROSSTABS for

CAUSE VS. OPAGE, OPEXPER, FORINST, STATE

for specific CAUSE's. PHASE11 also executes an SPSS BREAKDOWN for

FRACACC VS. CAUSE VS. OPALT

for specific CAUSE's. CAUSE changes from run to run and COM11A must be modified to make that change.

Output from PHASE11 is written to the file SPOUT. SPOUT may be printed as described in PHASE6.

To execute PHASE11, type the following.

```
-PHASE11

 SPSS/ONLINE V7.0/NOS

 USE AN SPSS SYSTEM FILE THIS RUN
 ENTER FILE NAME
 USE A RAW DATA FILE THIS RUN
 AUTO-MODE.
 ENTERING SPSS.
 SPSS/ONLINE AUTO-MODE

 USED  -     12 SBUS

READY.
```

Listings of PHASE11 and COM11A follow.

```
OLD,PHASE11
READY.
LNH
00100 PURGE,SPOUT/NA.
00110 DEFINE,SPOUT.
00120 ATTACH,GTFILE=NEW76SP.
00130 GET,TEMP=COM11A.
00140 GET,INPUT=SPIN.
00150 CALL,SPSS.
00160 RETURN,INPUT.
00170 REWIND,SPOUT.
00180 COPYBF,SPOUT,SEND.
00190 DISPOSE,SEND=PR/E1=X0712DC.
READY.
```

```
OLD,COM11A
READY.
LNH
GET FILE        NEW76SP
RUN NAME        OPERATOR ALTERNATIVE ANALYSIS(PHASE11)
SELECT IF       (TYPE1 EQ 12 AND (NCAUSE EQ 411 OR NCAUSE EQ 418))
CROSSTABS       NCAUSE BY OPAGE2 OPEXPER FORINST STATE
BREAKDOWN       TABLES=FRACACC BY NCAUSE BY NALT1 TO NALT6
FINISH
READY.
```

SECTION V. FILE DESCRIPTIONS

FILE NAME: BCDOUT

PHASE: PHASEO, PHASE1

LANGUAGE: DATA FILE

NARRATIVE: BCDOUT is the sequential data file written from SPSS containing one record for each boat reported in the SPSS system file. The length of each record is 101 characters.

LISTING: See Attachment A

FILE NAME: COM8A

PHASE: PHASE8

LANGUAGE: SPSS DIRECTIVES

NARRATIVE: COM8A contains directives to SPSS to perform BREAKDOWN analysis by type.

LISTING:

```
OLD,COM8A
READY.
LNH
GET FILE        NEW76SP
RUN NAME        TYPE ANALYSIS(PHASE8)
BREAKDOWN       VARIABLES=FRACACC(LO,HI)/FATALS(LO,HI)/
                INJURIES(LO,HI)/SUMFAT(0,12)/
                PROPDAM(LO,HI)/TYPE1(1,12)/
                TABLES=FRACACC,FATALS,INJURIES,PROPDAM BY TYPE1/
                FRACACC BY TYPE1 BY SUMFAT
FINISH
READY.
```

FILE NAME: COM9A

PHASE: PHASE9

LANGUAGE: SPSS DIRECTIVES

NARRATIVE: COM9A contains SPSS directives to perform BREAKDOWN analysis by cause within type.

LISTING:

```
OLD,COM9A
READY.
LNH
GET FILE       NEW76SP
RUN NAME       INITIATOR ANALYSIS(PHASE9)
SELECT IF      (TYPE1 EQ 12)
BREAKDOWN      TABLES=FRACACC,WEIFAT,WEINJ,WEIPRO BY NCAUSE /
               FRACACC BY NCAUSE BY SUMFAT
FINISH
READY.
```

FILE NAME: COM10A

PHASE: PHASE10

LANGUAGE: SPSS DIRECTIVES

NARRATIVE: COM10A contains SPSS directives to perform BREAKDOWN analysis by associated factor within cause and type.

LISTING:

```
OLD,COM10A
READY.
LNH
GET FILE        NEW76SP
RUN NAME        INITIATOR ANALYSIS(PHASE10)
SELECT IF       (TYPE1 EQ 12 AND ( NCAUSE EQ 411 OR NCAUSE EQ 418))
BREAKDOWN       TABLES=FRACACC WEIFAT WEINJ WEIPRO BY
                NFACT1 TO NFACT8/
                FRACACC BY NFACT1 TO NFACT8 BY SUMFAT
FINISH
READY.
```

FILE NAME: COM11A

PHASE: PHASE11

LANGUAGE: SPSS DIRECTIVES

NARRATIVE: COM11A contains SPSS directives to perform BREAKDOWN analysis by operator alternative within cause and type.

LISTING:

```
OLD;COM11A
READY.
LNH
GET FILE        NEW76SP
RUN NAME        OPERATOR ALTERNATIVE ANALYSIS(PHASE11)
SELECT IF       (TYPE1 EQ 12 AND (NCAUSE EQ 411 OR NCAUSE EQ 418))
CROSSTABS       NCAUSE BY OPAGE OPEXPER FORINST STATE
BREAKDOWN       TABLES=FRACALC BY NCAUSE BY NALT1 TO NAL16
FINISH
READY.
```

FILE NAME: COMENTS

PHASE: PHASE5

LANGUAGE: DATA FILE

NARRATIVE: COMENTS contains directions to the user instructing him/her that the file "FILINFO" must be edited to create "SPSSDIR" before it can be used by PHASE6.

LISTING:

```
OLD,COMENTS
READY.
LNH
THE FILE THAT HAS JUST BEEN CREATED
          "FILINFO"
MUST NOW BE EDITED BY MEANS OF "XEDIT"
AND REPLACED AS
          "SPSSDIR"
IN ORDER TO BE USED BY PHASE6.
READY.
```

FILE NAME: DEFBLD

PHASE: NONE

LANGUAGE: NOS CONTROL LANGUAGE

NARRATIVE: DEFBLD is a procedure file used to create the file DICT used by IS/ATHENA. DEFBLD attaches a file of data base specifications called ISADEF and from it creates the data base definition. This procedure does not need to be executed again unless the data base specifications should change. In that case, the file ISADEF must be modified and DEFBLD executed to recreate DICT.

LISTING:

```
OLD,DEFBLD
READY.
LNH
00100 PURGE,DICT/NA.
00110 DEFINE,DICT.
00120 GET,COMMAND=ISADEF.
00130 CALL,ISAV2.
READY.
```

FILE NAME: DEFBLD1

PHASE: NONE

LANGUAGE: NOS CONTROL LANGUAGE

NARRATIVE: DEFBLD1 is a procedure file used to create DICTO1 used by IS/ATHENA. DEFBLD1 attaches a file of data base specifications called ISADEF1 and from it creates the data base definition. This procedure does not need to be executed again unless the data base specifications should change. In that case, the file ISADEF1 must be modified and DEFBLD1 executed to recreate DICTO1.

LISTING:

```
OLD,DEFBLD1
READY.
LNH
00100 PURGE,DICT01/NA.
00110 DEFINE,DICT=DICT01.
00120 GET,COMMAND=ISADEF1.
00130 CALL,ISAV2.
READY.
```

FILE NAME: DICT

PHASE: DEFBLD, PHASE2

LANGUAGE: IS/ATHENA DEFINITION

NARRATIVE: DICT is an IS/ATHENA file containing the definition of each record on the initial IS/ATHENA data base.

LISTING: Unlistable

FILE NAME: DICTO1

PHASE: DEFBLD1, PHASE4

LANGUAGE: IS/ATHENA DEFINITION

NARRATIVE: DICTO1 is an IS/ATHENA file containing the definition of each record on the second and final IS/ATHENA data base.

LISTING: Unlistable

FILE NAME: FILINFO

PHASE: PHASE5

LANGUAGE: DATA FILE

NARRATIVE: FILINFO contains all pertinent information from the original SPSS system file (SB76FL) such as variable labels, value labels, print formats, etc. It is then to be edited to add the same information for associated factors, operator alternatives and cause to create SPSSDIR.

LISTING: See Attachment A.

FILE NAME: INFOIN

PHASE: PHASE5

LANGUAGE: SPSS DIRECTIVES

NARRATIVE: INFOIN contains the SPSS directives used to instruct SPSS to write on FILINFO all pertinent information on variable labels, value labels, print formats, etc. This file (FILINFO)is then to be edited to add the same information for associated factors, operator alternatives and cause to create SPSSDIR.

LISTING:

```
OLD,INFOIN
READY.
LNH
GET FILE          SB76FL
RUN NAME          WRITE FILEINFO
WRITE FILEINFO VARIABLES=ALL/ALL/
READY.
```

FILE NAME: ISABIN

PHASE: PHASE2, PHASE4, PHASE7

LANGUAGE: IS/ATHENA DIRECTIVES

NARRATIVE: ISABIN contains the command PROCESS which tells IS/ATHENA to take further directives from the local file COMMAND.

LISTING:

```
OLD,ISABIN
READY.
LNH
PROCESS.
READY.
```

FILE NAME: ISABLD

PHASE: PHASE2

LANGUAGE: IS/ATHENA DIRECTIVES

NARRATIVE: ISABLD contains directives to IS/ATHENA to create the initial IS/ATHENA data base from the boating accident records on the file SSAMP.

LISTING:

```
OLD,ISABLD
READY.
LNH
RECORD,121,RBSEN,9.
DICTIONARY.
BUILD,DATABASE,WHERE,KEY=SERIAL,SEQNUM.
FINISH.
READY.
```

FILE NAME: ISABLD1

PHASE: PHASE4

LANGUAGE: IS/ATHENA DIRECTIVES

NARRATIVE: ISABLD1 contains directives to IS/ATHENA to create the second and final IS/ATHENA data base from the boating accident records on the file NEWSAMP.

LISTING:

```
OLD,ISABLD1
READY.
LNH
RECORD,173,RBSEM,9.
DICTIONARY.
BUILD,DATABASE,WHERE,KEY=SERIAL,SEQNUM.
FINISH.
READY.
```

FILE NAME: ISADEF

PHASE: DEFBLD

LANGUAGE: IS/ATHENA DIRECTIVES

NARRATIVE: ISADEF is a file describing to IS/ATHENA how to build the dictionary DICT for the initial IS/ATHENA data base.

LISTING: See Attachment A.

FILE NAME: ISADEF1

PHASE: DEFBLD1

LANGUAGE: IS/ATHENA DIRECTIVES

NARRATIVE: ISADEF1 is a file describing to IS/ATHENA how tc build the dictionary DICT01 for the second and final IS/ATHENA data base.

LISTING: See Attachment A.

FILE NAME: ISAWRYT

PHASE: PHASE3

LANGUAGE: IS/ATHENA DIRECTIVES

NARRATIVE: ISAWRYT contains the IS/ATHENA directives necessary to write a sequential data file from the IS/ATHENA data base RBSEM. This file is then used to generate the first report.

LISTING:

```
OLD,ISAWRYT
READY.
LNH
RECORD,121,RBSEM,9.
DICTIONARY.
SPACING,0.
SUBSIZE,404.
SUBSET,SERIAL,SEQNUM,JURIS,OPAGE,OPEXPERL,RENTED,
POB,FORINSTL,MFGCODE,TYPEBOATL,HULLMAT,PROPUL,POWER,
LENGTH,YRBUILT,MONTH,DAY,YR,TIME,WATERTYPL,STATE,
COUNTY,DISTRICT,WEATHER,WATERCONL,SEATEMPL,WIND,VISIBIL,
OPATTIMEL,TYPE1L,TYPE2,TYPE3,PFDS,PROPDAM,DROWNVIC,
OTHERVIC,INJURIES,NUMBVES,CAUSE1,CAUSE2,CAUSE3,DESC1,
DESC2,DESC3,DESC4,JULDATE,DAYOFWEEK,FATALS,FRACACC,RTYPE,
WHERE,SERIAL>=00000.
FINISH.
READY.
```

FILE NAME: ISBWRYT

PHASE: PHASE7

LANGUAGE: IS/ATHENA DIRECTIVES

NARRATIVE: ISBWRYT contains the IS/ATHENA directives necessary to write a sequential data file from the second IS/ATHENA data base RBSEM. This file is then used to generate the second report.

LISTING:

```
OLD,ISBWRYT
READY.
LNH
RECORD,173,RBSEM,9.
DICTIONARY.
SPACING,0.
SUBSIZE,1004.
SUBSET,SERIAL,SEQNUM,JURIS,OPAGE,OPEXPERL,RENTED,
POB,FORINSTL,MFGCODE,TYPEBOATL,HULLMAT,PROPUL,POWER,
LENGTH,YRBUILT,MONTH,DAY,YR,TIME,WATERTYPL,STATE,
COUNTY,DISTRICT,WEATHER,WATERCONL,SEATEMPL,WIND,VISIBIL,
OPATTIMEL,TYPE1L,TYPE2,TYPE3,PFDS,PROPDAM,DROWNVIC,
OTHERVIC,INJURIES,NUMBVES,CAUSE1,CAUSE2,CAUSE3,DESC1,
DESC2,DESC3,DESC4,JULIDATE,DAYOFWEEK,FATALS,FRACACC,RTYPE,
NCAUSEL,FACT1L,FACT2L,FACT3L,FACT4L,FACT5L,FACT6L,FACT7L,FACT8L,
ALT1L,ALT2L,ALT3L,ALT4L,ALT5L,ALT6L,
WHERE,SERIAL>=00000.
FINISH.
READY.
```

FILE NAME: MERGE

PHASE: PHASE4

LANGUAGE: COBOL

NARRATIVE: MERGE is the COBOL program that merges REPDA and SSAMP to produce NEWSAMP.

LISTING: See Attachment A.

FILE NAME: MERGDAT

PHASE: PHASE4

LANGUAGE: DATA FILE

NARRATIVE: MERGDAT is a direct access file containing the newly keypunched data from report 1. It contains serial/sequence number, cause, 8 associated factors and 6 operator alternatives per record.

LISTING:

```
ATTACH,MERGDAT
READY.
LNH,F=MERGDAT
0101200160430102                    501502
0101600192100103                    701
01029003432301                      501
0103700424110204                    801
01055006641401                      801
01061007401901                      101
0106500783330203                    501
01094011441803                      501502
01097011803103                      101102
0112501530750104                    257258
0113001583320106                    502
0204502190260107                    101
0208102497250102                    401402
0302802853300102                    501
0303202890650104                    201202
0307103340240304                    103
030710335024                        103104
03103037541904                      801802
03132041107501                      257258
04003042002401                      103104
04007042403106                      104
04012043103105                      110
04012043203106                      110
04034045107507                      201
040440460024                        101102
05016050341406                      803
05061056007504                      258
0508305900310102                    103
05116063233303                      504
05327092241803                      802
READY.
```

FILE NAME: NEWSAMP

PHASE: PHASE4

LANGUAGE: DATA FILE

NARRATIVE: NEWSAMP is the data file resulting from the merge of REPDA (sorted keypunched info) and SSAMP (sorted sample).

LISTING: Unlistable.

FILE NAME: NEW76SP

PHASE: PHASE6, PHASE8, PHASE9, PHASE10, PHASE11

LANGUAGE: SPSS SYSTEM FILE

NARRATIVE: NEW76SP is the SPSS system file consisting of only the sample records with cause, associated factors, operator alternatives.

LISTING: Unlistable.

FILE NAME: PASS1

PHASE: PHASE1

LANGUAGE: FORTRAN IV

NARRATIVE: PASS1 is the source code of the binary file PASS1B used in PHASE1. For a description of its function, see program listing, Attachment A.

LISTING: See Attachment A.

FILE NAME: PASS1B

PHASE: PHASE1

LANGUAGE: FORTRAN IV

NARRATIVE: PASS1B is the compiled binary of the source PASS1.

LISTING: Unlistable.

FILE NAME: PHASEO

PHASE: PHASEO

LANGUAGE: NOS CONTROL LANGUAGE

NARRATIVE: Procedure file used to copy SPSS system file to disk file SB76FL and write a sequential data file from SB76FL called BCDOUT.

LISTING:

```
OLD,PHASE0
READY.
LNH
00100 USN(TAPE=KW4333=S12448)
00110 REQUEST(TAPE,NT,PE,PO=R,LB=KL,F=SI)
00120 PURGE,SB76FL/NA.
00130 DEFINE,SB76FL.
00140 COPYBF,TAPE,SB76FL.
00150 UNLOAD,TAPE.
00160 RETURN,TAPE.
00170 PURGE,BCDOUT/NA.
00180 DEFINE,BCDOUT.
00190 PURGE,SPOUT/NA.
00200 DEFINE,SPOUT.
00210 RETURN,SB76FL.
00220 ATTACH,GTFILE=SB76FL.
00230 GET,TEMP=SPCON1.
00240 GET,INPUT=SPIN.
00250 CALL,SPSS.
00260 RETURN,INPUT.
READY.
```

FILE NAME: PHASE1

PHASE: PHASE1

LANGUAGE: NOS CONTROL LANGUAGE

NARRATIVE: PHASE1 is a procedure file used to execute PASS1 and SEL to create the sequential sample data file used by later phases.

LISTING:

```
OLD,PHASE1
READY.
LNH
00100 GET,PASS1B.
00110 ATTACH,SPSOUT=BCDOUT.
00115 FILE(SPSOUT,BT=C,RT=Z,FL=101)
00116 LDSET(FILES=SPSOUT)
00120 PASS1B.
00130 REPLACE,WRKFIL,RANREC.
00140 REWIND,WRKFIL,RANREC.
00150 GET,SORTIN.
00160 FILE(RANREC,BT=C,RT=Z,FL=113,BFS=5200)
00170 FILE(SORTED,BT=C,RT=Z,FL=113,BFS=5200)
00175 RFL,100000.
00180 SORTMRG(I=SORTIN,O=LIST1)
00185 REWIND,LIST1.
00187 COPY,LIST1.
00190 REPLACE,SORTED.
00210 2RUN,GET,SELB,SORTED,WRKFIL.
00220 SELB.
00230 REWIND,SAMPLE.
00240 REPLACE,SAMPLE.
00250 FILE(SAMPLE,BT=C,RT=Z,FL=121,BFS=2600)
00260 FILE(SSAMP,BT=C,RT=Z,FL=121,BFS=2600)
00270 GET,SORTOUT.
00275 RFL,100000.
00280 SORTMRG(I=SORTOUT,O=LIST2)
00285 REWIND,LIST2.
00287 COPY,LIST2.
00290 REWIND,SSAMP.
00300 REPLACE,SSAMP.
READY.
```

FILE NAME: PHASE2

PHASE: PHASE2

LANGUAGE: NOS CONTROL LANGUAGE

NARRATIVE: PHASE2 is a procedure file that uses SSAMP and DICT to create the initial IS/ATHENA data base.

LISTING:

```
OLD,PHASE2
READY.
LNH
00100 GET,SUBSET=SSAMP.
00110 ATTACH,DICT.
00120 PURGE,RBSEM/NA.
00130 RETURN,RBSEM.
00140 DEFINE,RBSEM.
00150 GET,COMMAND=ISABLD.
00160 GET,INPUT=ISABIN.
00170 CALL,ISAV2.
00180 RETURN,INPUT.
00190 RETURN,SUBSET.
READY.
```

FILE NAME: PHASE3

PHASE: PHASE3

LANGUAGE: NOS CONTROL LANGUAGE

NARRATIVE: PHASE3 is a procedure file used to write a sequential data file from the IS/ATHENA data base RBSEM. This data file called SUBSET is then used to produce Report 1.

LISTING:

```
OLD,PHASE3
READY.
LNH
00100 PURGE,SUBSET/NA.
00110 DEFINE,SUBSET.
00120 ATTACH,DICT.
00130 ATTACH,RBSEM.
00140 GET,CONMAND=ISAWRYT.
00150 GET,INPUT=ISABIN.
00160 CALL,ISAV2.
00170 RETURN,INPUT.
00180 RETURN,SUBSET.
00190 ATTACH,DISK1=SUBSET.
00200 GET,REPB1.
00210 REPB1.
00220 REWIND,DISK2.
00230 DISPOSE,DISK2=PR/EI=X0712DC.
00240 RETURN,SUBSET.
READY.
```

FILE NAME: PHASE4

PHASE: PHASE4

LANGUAGE: NOS CONTROL LANGUAGE

NARRATIVE: PHASE4 is a procedure file used to read the sorted sample data file SSAMP (121 Char/Rec) and the keypunched data file MERGDAT and create a new data file NEWSAMP (173 Char/Rec). This new data file is then used along with DICT01 to create the seccnd and final IS/ATHENA data base RBSEM.

LISTING:

```
OLD,PHASE4
READY.
LNH
PURGE,NEWSAMP/NA.
DEFINE,NEWSAMP.
GET,SSAMP,SRTINP.
ATTACH,MERGDAT.
RFL,100000.
FILE,SSAMP,BT=C,RT=Z,FL=121,BFS=2600.
FILE,MERGDAT,BT=C,RT=Z,MRL=80,BFS=2600.
FILE,REPDA,BT=C,RT=Z,MRL=80,BFS=2600.
FILE,NEWSAMP,BT=C,RT=Z,FL=173,BFS=2600.
SORTMRG,I=SRTINP,O=SRTOUT.
RETURN,MERGDAT,SRTINP.
GET,MERGE.
COBOL,I=MERGE,L=LMERGE.
LDSET,FILES=NEWSAMP/SSAMP/REPDA.
LGO.
RETURN,NEWSAMP.
ATTACH,SUBSET=NEWSAMP.
ATTACH,DICT=DICT01.
PURGE,RBSEM/NA.
RETURN,RBSEM.
DEFINE,RBSEM.
GET,COMMAND=ISABLD1.
GET,INPUT=ISABIN.
CALL,ISAV2.
RETURN,INPUT.
RETURN,SUBSET.
READY.
```

FILE NAME: PHASE5

PHASE: PHASE5

LANGUAGE: NOS CONTROL LANGUAGE

NARRATIVE: PHASE5 is a procedure file used to attach the 1976 SPSS system file and execute an SPSS procedure to write descriptive information about that file on FILINFO.

LISTING:

```
OLD,PHASE5
READY.
LNH
00100 PURGE,FILINFO/NA.
00110 DEFINE,BCDOUT=FILINFO.
00120 ATTACH,GTFILE=SB76FL.
00130 REWIND,GTFILE.
00140 GET,TEMP=INFOIN.
00150 GET,INPUT=SPIN.
00160 CALL,SPSS.
00170 RETURN,INPUT.
00180 GET,COMENTS.
00190 LIST,COMENTS.
READY.
```

FILE NAME: PHASE6

PHASE: PHASE6

LANGUAGE: NOS CONTROL LANGUAGE

NARRATIVE: PHASE6 is a procedure file used to attach the data file NEWSAMP and using the descriptive information on SPSSDIR, create a new SPSS system file NEW76SP.

LISTING:

```
OLD,PHASE6
/LNH
00100 ATTACH,NEWSAMP.
00110 PURGE,SPOUT/NA.
00120 PURGE,NEW76SP/NA.
00130 RETURN,NEW76SP.
00140 DEFINE,SVFILE=NEW76SP.
00150 DEFINE,SPOUT.
00160 GET,SPSSDIR.
00165 GET,INPUT=SPSSIN.
00170 CALL,SPSS.
00175 RETURN,INPUT.
00180 REWIND,SPOUT.
00190 COPYBF,SPOUT,SEND.
00200 DISPOSE,SEND=PR/E1=X0/12DC.
```

FILE NAME: PHASE7

PHASE: PHASE7

LANGUAGE: NOS CONTROL LANGUAGE

NARRATIVE: PHASE7 is a procedure file used to write a sequential data file SUBSET1 out of the final IS/ATHENA data base RBSEM and using this file, produce COBOL report 2.

LISTING:

```
 OLD,PHASE7
/LNH
00100 PURGE,SUBSET1/NA.
00110 DEFINE,SUBSET=SUBSET1.
00120 ATTACH,DICT=DICT01.
00130 ATTACH,RBSEM.
00140 GET,COMMAND=ISBWRYT.
00150 GET,INPUT=ISABIN.
00170 CALL,ISAV2.
00180 RETURN,INPUT.
00190 RETURN,SUBSET.
00200 ATTACH,DISK1=SUBSET1.
00210 GET,REPB2.
00220 ATTACH,SCENARO.
00230 FILE,SCENARO,BT=C,RT=Z,FL=80,BFS=2600.
00240 FILE,DISK1,BT=C,RT=Z,FL=1004,BFS=6000.
00250 LDSET,FILES=SCENARO/DISK1.
00260 REPB2.
00270 REWIND,DISK2.
00280 DISPOSE,DISK2=PR/EI=X0712DC.
/
```

FILE NAME: PHASE8

PHASE: PHASE8

LANGUAGE: NOS CONTROL LANGUAGE

NARRATIVE: PHASE8 is a procedure file used to execute an SPSS procedure to perform type analysis on the sample SPSS system file.

LISTING:

```
OLD,PHASE8
READY.
LNH
00100 PURGE,SPOUT/NA.
00110 DEFINE,SPOUT.
00120 ATTACH,GTFILE=NEW76SP.
00130 GET,TEMP=COM8A.
00140 GET,INPUT=SPIN.
00150 CALL,SPSS.
00160 RETURN,INPUT.
00170 REWIND,SPOUT.
00180 COPYBF,SPOUT,SEND.
00190 DISPOSE,SEND=PR/EI=X0712DC.
READY.
```

FILE NAME: PHASE9

PHASE: PHASE9

LANGUAGE: NOS CONTROL LANGUAGE

NARRATIVE: PHASE9 is a procedure file used to execute an SPSS procedure to perform cause analysis restricted by type on the sample SPSS system file.

LISTING:

```
OLD,PHASE9
READY.
LNH
00100 PURGE,SPOUT/NA.
00110 DEFINE,SPOUT.
00120 ATTACH,GIFILE=NEW76SP.
00130 GET,TEMP=COM9A.
00140 GET,INPUT=SPIN.
00150 CALL,SPSS.
00160 RETURN,INPUT.
00170 REWIND,SPOUT.
00180 COPYBF,SPOUT,SEND.
00190 DISPOSE,SEND=PR/EI=X0712DC.
READY.
```

FILE NAME: PHASE1C

PHASE: PHASE10

LANGUAGE: NOS CONTROL LANGUAGE

NARRATIVE: PHASE10 is a procedure file used to execute an SPSS procedure to analyse associated factors restricted by type and cause.

LISTING:

```
OLD,PHASE10
READY.
LNH
00100 PURGE,SPOUT/NA.
00110 DEFINE,SPOUT.
00120 ATTACH,GTFILE=NEW76SP.
00130 GET,TEMP=COM10A.
00140 GET,INPUT=SPIN.
00150 CALL,SPSS.
00160 RETURN,INPUT.
00170 REWIND,SPOUT.
00180 COPYBF,SPOUT,SEND.
00190 DISPOSE,SEND=PR/EI=X0712DC.
READY.
```

FILE NAME: PHASE11

PHASE: PHASE11

LANGUAGE: NOS CONTROL LANGUAGE

NARRATIVE: PHASE11 is a procedure file used to perform an SPSS procedure to analyze operator alternatives restricted by type and cause and also to print operator demographics.

LISTING:

```
OLD,PHASE11
READY.
LNH
PURGE,SPOUT/NA.
DEFINE,SPOUT.
ATTACH,GTFILE=NEW76SP.
GET,TEMP=COM11A.
GET,INPUT=SPIN.
CALL,SPSS.
RETURN,INPUT.
REWIND,SPOUT.
COPYBF,SPOUT,SEND.
DISPOSE,SEND=PR/EI=X0/12DC.
READY.
```

FILE NAME: RANREC

PHASE: PHASE1

LANGUAGE: DATA FILE

NARRATIVE: RANREC is a 113 char/record data file created by PASS1. It contains the original BCDOUT record in which each record has appended a good/bad record flag, a multiple boat accident flag, and a 10 character random number.

LISTING: See Attachment A.

FILE NAME: RBSEM

PHASE: PHASE2, PHASE3, PHASE4, PHASE7

LANGUAGE: IS/ATHENA

NARRATIVE: RBSEM is the direct access file containing the initial IS/ATHENA data base in PHASE2. In PHASE4 it becomes the second and final IS/ATHENA data base.

LISTING: Unlistable.

FILE NAME:	REP1
PHASE:	PHASE3
LANGUAGE:	COBOL
NARRATIVE:	REP1 contains the source of the compiled binary file REPB1 used in PHASE3. It is used to produce report 1.
LISTING:	See Attachment A.

FILE NAME: REP2

PHASE: PHASE7

LANGUAGE: COBOL

NARRATIVE: REP2 is the source of the compiled binary REPB2 used to produce report 2.

LISTING: See Attachment A.

FILE NAME: REPB1

PHASE: PHASE3

LANGUAGE: COBOL

NARRATIVE: REPB1 is the compiled binary of the source program REP1 used to produce report 1.

LISTING:

FILE NAME: REPB2

PHASE: PHASE7

LANGUAGE: COBOL

NARRATIVE: REPB2 is the compiled binary of tne source program REP2 used to produce report 2.

LISTING: See Attachment A.

FILE NAME: REPDA

PHASE: PHASE4

LANGUAGE: DATA FILE

NARRATIVE: REPDA is the file produced by sorting MERGDAT on ascending serial number.

LISTING: See listing of MERGDAT.

FILE NAME:	SAMPLE
PHASE:	PHASE1
LANGUAGE:	DATA FILE
NARRATIVE:	SAMPLE is the 121 char/record data file produced by the execution of the SEL FORTRAN program. It contains selected records chosen from the original file. These records will be used for further analysis.

LISTING: See Attachment A.

FILE NAME: SB76FL

PHASE: PHASEO

LANGUAGE: DATA FILE

NARRATIVE: 1976 BAR SPSS system file copied from tape.

LISTING: Unlistable.

FILE NAME: SCENARO

PHASE: PHASE7

LANGUAGE: DATA FILE

NARRATIVE: SCENARO contains the keypunched scenario data for each record in the sample chosen for analysis.

LISTING:

```
ATTACH,SCENARO
READY.
LNH,F=SCENARO
010550066AOPERATOR WAS TRAVELING FASTER THAN CONDITIONS WARRANTED - -
010550066BTHE SUN WAS IN HIS EYES AND THE LAKE WAS ROUGH.  HE
010550066CAPPARENTLY DID NOT SEE THE LOGS AND OTHER DEBRIS IN THE
010550066DWATER AND UPON STRIKING THE DEBRIS HE LOST CONTROL OF THE
010550066EBOAT RESULTING IN THE ACCIDENT.
011300158ATHE BOAT HAD JUST BEEN REFUELED AND WAS LEAVING THE DOCK
011300158BAREA.  THERE WERE FUMES AND SLIGHT SPILLAGE FROM THE
011300158CREFUELING WHICH WERE IGNITED WHEN ONE OF THE OCCUPANTS LIT A
011300158DCIGARETTE.
050040488AOCCUPANTS WERE USING A CHARCOAL GRILL ON THE DECK AND THE
050040488BDEVICE WAS TIPPED OVER DURING A FIGHT AMONG THEM.  BOAT WAS
050040488CTOTALLY DESTROYED BUT THERE WERE KNOW FATALITIES.
050160503AOPERATOR WAS DRUNK AND LOST CONTROL OF HIS BOAT WHICH
050160503BRESULTED IN HIM HITTING A DOCK, 3 MARKER BUEOYS, SIDESWIPING
050160503CA GRAVEL DREGER, WIPING OUT A FLOCK OF DUCKS AND NARROWING
050160503DMISSING A LITTLE OLD LADY IN A GREEN VW DRIVING ON THE
050160503EPERIMETER ROAD AROUND THE LAKE, AND FINALLY COMING TO REST
050160503FIN THE PARK RANGERS LILY POND WHICH IS LOCATED ONLY A FEW
050160503GYARDS FROM THE BEACH AND PICNIC AREAS AND THE ONLY
050160503HINJURY HE RECEIVED WAS A CUT FINGER WHEN HE WAS OPENING A
050160503ICAN OF BEER, JUST BEFORE HE HIT THE DUCKS.
050640563AOPERATOR WAS TRYING TO REFUEL BOAT FROM A 5-GALLON CAN WHILE
050640563BUNDER MOTION AND SPILLED FUEL WHICH WAS IGNITED BY SMOKING
050640563COCCUPANTS.
READY.
```

FILE NAME: SEL

PHASE: PHASE1

LANGUAGE: FORTRAN

NARRATIVE: SEL is source of the compiled binary SELB used in PHASE1. For a description of its purpose, see the program listing, Attachment A.

LISTING: See Attachment A.

FILE NAME: SELB

PHASE: PHASE1

LANGUAGE: FORTRAN IV

NARRATIVE: SELB is the compiled binary of the FORTRAN program SEL.

LISTING: Unlistable.

FILE NAME:	SORTED
PHASE:	PHASE1
LANGUAGE:	DATA FILE
NARRATIVE:	SORTED is the data file produced as a result of sorting RANREC by ascending random number, ascending serial number and descending multiple boat flag.
LISTING:	See Attachment A for listing of RANREC.

FILE NAME: SORTIN

PHASE: PHASE1

LANGUAGE: SORT/MERGE DIRECTIVES

NARRATIVE: SORTIN contains directives to SORT/MERGE to sort the file RANREC giving the file SORTED.

LISTING:

```
OLD,SORTIN
READY.
LNH
SORT
FILE,INPUT=RANREC(R),OUTPUT=SORTED(R)
FIELD,SERNO(1,5,DISPLAY)
FIELD,RAND(102,10,DISPLAY)
FIELD,MULBOT(112,1,DISPLAY)
KEY,RAND(A),SERNO(A),MULBOT(D)
END
READY.
```

FILE NAME: SORTOUT

PHASE: PHASE1

LANGUAGE: SORT/MERGE DIRECTIVES

NARRATIVE: SORTOUT contains directives to SORT/MERGE to read the file SAMPLE and sort it by ascending serial number to produce SSAMP.

LISTING:

```
OLD,SORTOUT
READY.
LNH
SORT
FILE,INPUT=SAMPLE(R),OUTPUT=SSAMP(R)
FIELD,SERNO(1,9,DISPLAY)
KEY,SERNO(A)
END
READY.
```

FILE NAME: SPCOM1

PHASE: PHASEO

LANGUAGE: SPSS DIRECTIVES

NARRATIVE: SPCOM1 is an SPSS directives file used to write the sequential data file BCDOUT from the system file SB76FL.

LISTING:

```
OLD,SPCOM1
READY
LNH
GET FILE          SB76FL
RUN NAME          SPSS WRITE CASES-SB76FL
SUBFILE LIST      TEST(1000),REST(8012)
RUN SUBFILES      TEST
WRITE CASES       (F5.0,F4.0,F1.0,F2.0,1HE,F1.0,F1.0,
                  F2.0,1HI,F1.0,A3,1HA,F1.0,F1.0,
                  F1.0,F3.0,F2.0,F2.0,F2.0,
                  F2.0,F1.0,F2.0,1HW,F1.0,A2,
                  F3.0,F2.0,F1.0,1HC,F1.0,1HS,F1.0,
                  2F1.0,1HO,F2.0,1HT,2F2.0,
                  F2.0,F1.0,F5.0,F1.0,F1.0,
                  2F1.0,3F2.0,
                  4F2.0,F5.0,
                  2F1.0,F4.2)
                  SERIAL,SEQNUM,JURIS,OPAGE,OPEXPER,RENTED,
                  POB,FORINST,MFGCODE,TYPEBOAT,HULLMAT,
                  PROPUL,POWER,LENGTH,YRBUILT,MONTH,
                  DAY,YEAR,TIME,WATERTYP,STATE,
                  COUNTY,DISTRICT,WEATHER,WATERCON,SEATEMP,
                  WIND,VISIBIL,OPATTIME,TYPE1,TYPE2,
                  TYPE3,PFDS,PROPDAM,DROWNVIC,OTHERVIC,
                  INJURIES,NUMBVES,CAUSE1,CAUSE2,CAUSE3,
                  DESC1,DESC2,DESC3,DESC4,JULDATE,
                  DAYOFWK,FATALS,FRACACC
READY.
```

FILE NAME: SPIN

PHASE: PHASE0, PHASE5, PHASE8, PHASE9, PHASE10, PHASE11

LANGUAGE: SPSS DIRECTIVES

NARRATIVE: SPIN contains SPSS directives to SPSS on-line to be used with SPCOM1 to create a sequential data file BCDOUT from SB76FL.

LISTING:

```
OLD,SPIN
READY.
LNH
YES
GTFILE
NO
SREAD TEMP
PAGE 9999
EXECUTE SPOUT
END
READY.
```

FILE NAME: SPOUT

PHASE: PHASE0, PHASE5, PHASE6, PHASE8, PHASE9, PHASE10, PHASE11

LANGUAGE: DATA FILE

NARRATIVE: SPOUT contains the output of all SPSS runs. It is a direct access file.

LISTING: See Attachment A.

FILE NAME: SPSSDIR

PHASE: PHASE6

LANGUAGE: DATA FILE

NARRATIVE: SPSSDIR contains descriptive information as value labels, variable labels, print formats, etc. to be used in creating the new sample SPSS system file NEW76SP.

LISTING: See Attachment A.

FILE NAME: SPSSIN

PHASE: PHASE6

LANGUAGE: SPSS DIRECTIVES

NARRATIVE: SPSSIN contains directives to SPSS on-line to be used with SPSSDIR in creating the new SPSS system file NEW76SP.

LISTING:

```
OLD,SPSSIN
READY.
LNH
NO
YES
NEWSAMP
SREAD SPSSDIR
PAGE 9999
PARAM RL=180
EXECUTE SPOUT
END
READY.
```

FILE NAME: SRTINP

PHASE: PHASE4

LANGUAGE: SORT/MERGE DIRECTIVES

NARRATIVE: SRTINP contains SORT/MERGE directives to sort MERGDAT by ascending serial number giving REPDA.

LISTING:

```
OLD,SRTINP
READY.
LNH
SORT
FILE,INPUT=MERGDAT(R),OUTPUT=REPDA(R)
FIELD,SERIAL(1,9)
KEY,SERIAL(A)
END
READY.
```

FILE NAME: SSAMP

PHASE: PHASE1, PHASE2, PHASE4

LANGUAGE: DATA FILE

NARRATIVE: SSAMP is the file SAMPLE sorted by ascending serial/sequence number.

LISTING: See listing of SAMPLE - Attachment A.

FILE NAME: SUBSET

PHASE: PHASE3

LANGUAGE: DATA FILE

NARRATIVE: SUBSET is the sequential data file produced by IS/ATHENA in PHASE3 and used to produce report 1. It contains each record in the sample.

LISTING: Unlistable.

FILE NAME: SUBSET1

PHASE: PHASE7

LANGUAGE: DATA FILE

NARRATIVE: SUBSET1 is the sequential data file produced by IS/ATHENA in PHASE7 and used to produce report 2. It contains each record in the sample.

LISTING: Unlistable.

FILE NAME: WRKFIL

PHASE: PHASE1

LANGUAGE: DATA FILE

NARRATIVE: WRKFIL is a file produced by PASS1B containing counts on BCDOUT for each of the 12 types, fatal/nonfatal, good/bad.

LISTING:

```
OLD,WRKFIL
READY.
LNH
              71            1            0           66     4
              69           35            7           26     1
              33            7            2           23     1
              43            3            1           35     4
              38            2            0           34     2
              17            0            0           14     3
             472            5            1          427    39
              78           10            0           64     4
              56            5            0           47     4
              34           25            4            5     0
               0            0            0            0     0
              16            3            0           13     0
             927
READY.
```

APPENDIX H. A BRIEF NARRATIVE ON PROGRAM PASS1, THE SORT DESCRIPTION, AND CORRESPONDING FLOW DIAGRAM*

The program PASS1 is used to make a quick pass through the Boating Accident Report (BAR) file (BCDOUT), gathering statistics on accidents and preparing the file for random accident selection. The only input to the program is the BAR file sorted into ascending order by accident serial number. Output consists of a printed summary of the accidents (WRKFIL) and a new BAR file (RANREC) with three new fields added.

As a record is read, its serial number (SERNO) is compared to that of the previous record (OLDSN). If they are different, the current record is one of a unique accident. If the serial numbers are the same, the record is assumed to be one of a multiple-boat accident, and the multiple-boat indicator is set. Several of the more important fields have checks for "I don't know" responses coded into them. If the number of these bad fields exceeds a user set tolerance (TOLRNC), the record will be flagged as a bad record.

As records are written, a unique ten-digit random number field is added to all single boat records. This random number is generated by a call to the FORTRAN function RANF(X) with the resultant random number being stored in the FORTRAN variable RANDOM. Should a record be determined to be one of a multiple-boat accident, RANF is called only once for the whole accident and the same value of RANDOM appended to each record. Consequently, when the file is sorted into ascending random number order, all records of a multiple-boat accident will fall together.

Execution of the PASS1 FORTRAN program generates two files - RANREC and WRKFIL. RANREC is identical to BCDOUT (the input file) except that each record now has appended to it a 10-character random number (col 97-106), a one-character multiple-boat indicator (col 107), and a one-character good/bad record flag (col 108). WRKFIL contains the statistics on each of the 12 accident types necessary for SELECT to choose the appropriate records for further examination. This includes a count of fatal/non-fatal accidents for each of the 12 types. The

* The program specifications and capabilities were prepared by the Control Data Corporation and the support staff at the Atlanta, GA facility.

fatal/non-fatal counts for an accident type are further broken down into good (complete) and bad (missing information exceeds tolerable limit) records. WRKFIL passes this information to the selection program and also writes it to the output listing. This summary is the only output produced by PASS1.

Figure H-1 shows a flow diagram of the PASS1 program.

SORT DESCRIPTION

Now that PASS1 has created the appended file RANREC, that file must be sorted into random number order so that a sequential read of that file will essentially produce a randomly chosen record on any given read. The sorted file is named SORTED. The file RANREC is consequently sorted by ascending random number and within random number by ascending serial number. Within ascending serial number it is sorted by descending multiple-boat number and finally by the bad record flag placing good records before bad. Since multiple boats in an accident have the same random number, they will naturally fall together. Since it is also mathematically possible that the RANF(X) function could generate the same random number twice and this could happen on a multiple-boat accident, to keep records of an accident together, the file is sorted as noted above by ascending serial number within ascending random number. The multiple-boat field always contains the number (n-1) where n is the number of boats in the accident (thus the field has the value zero for a single-boat accident). This field is sorted into descending order so that any time SELECT reads a record, it can check that field to know how many more records it must read to get all records for that accident.

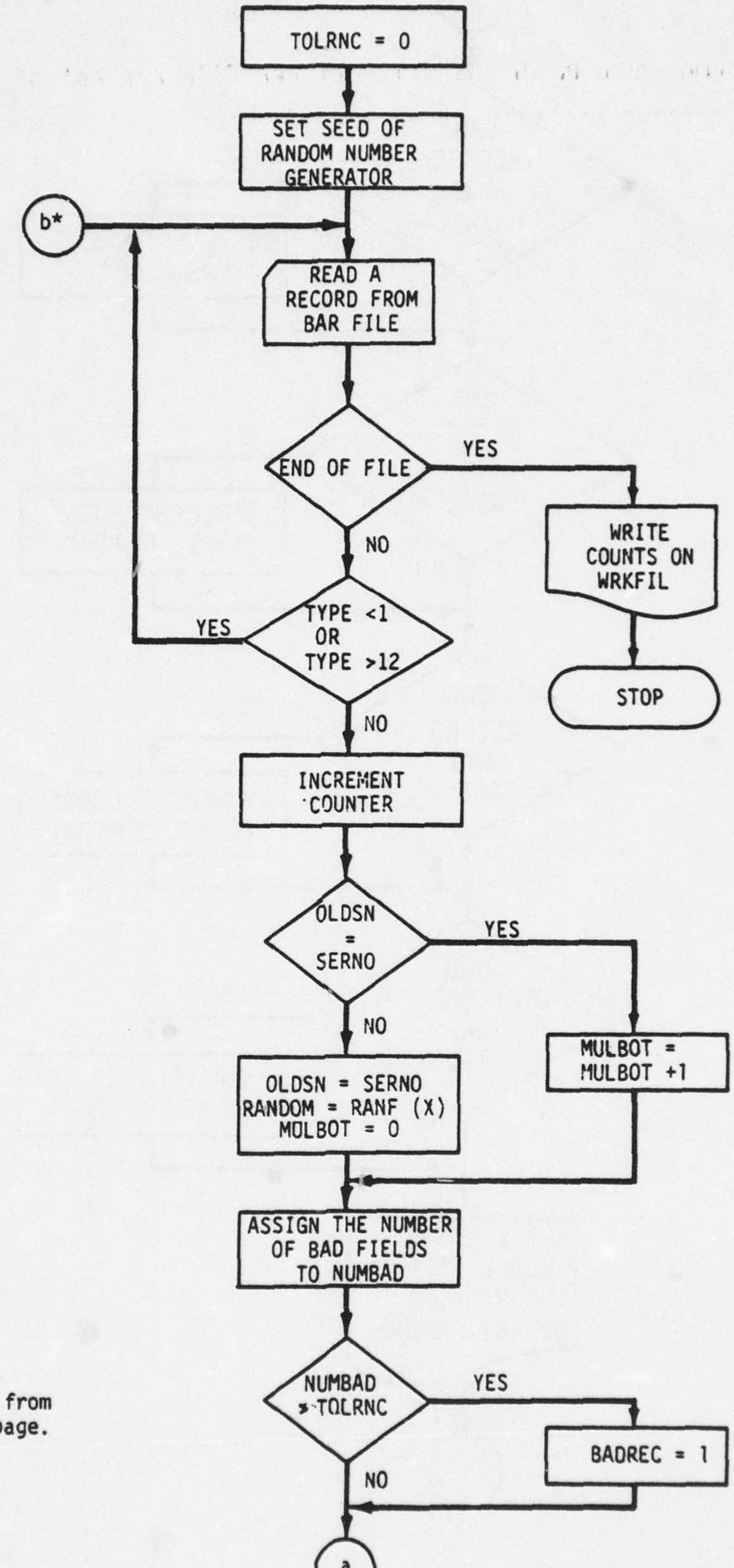
Setting of the bad record flag depends on the variables NUMBAD and TOLRNC. Six fields are checked for a value of unknown. These fields are:

1) Age of operator
2) Type of boat
3) Date of accident
4) Water condition
5) Operation at time of accident
6) Type of accident.

For each one that is found to be unknown, NUMBAD is incremented by one. TOLRNC says how large NUMBAD can be before the bad record flag is set. TOLRNC is currently programatically set to 0 but can be changed by changing one statement in the FORTRAN program.

Note also that some records in the original BAR file are not of type 1 through type 12. These records are eliminated from further consideration.

For sample listings of the files RANREC and SORTED, see Attachment A program listings.



* Enter here from following page.

FIGURE H-1. FLOW DIAGRAM FOR PROGRAM PASS1 (CONTINUED ON NEXT PAGE)

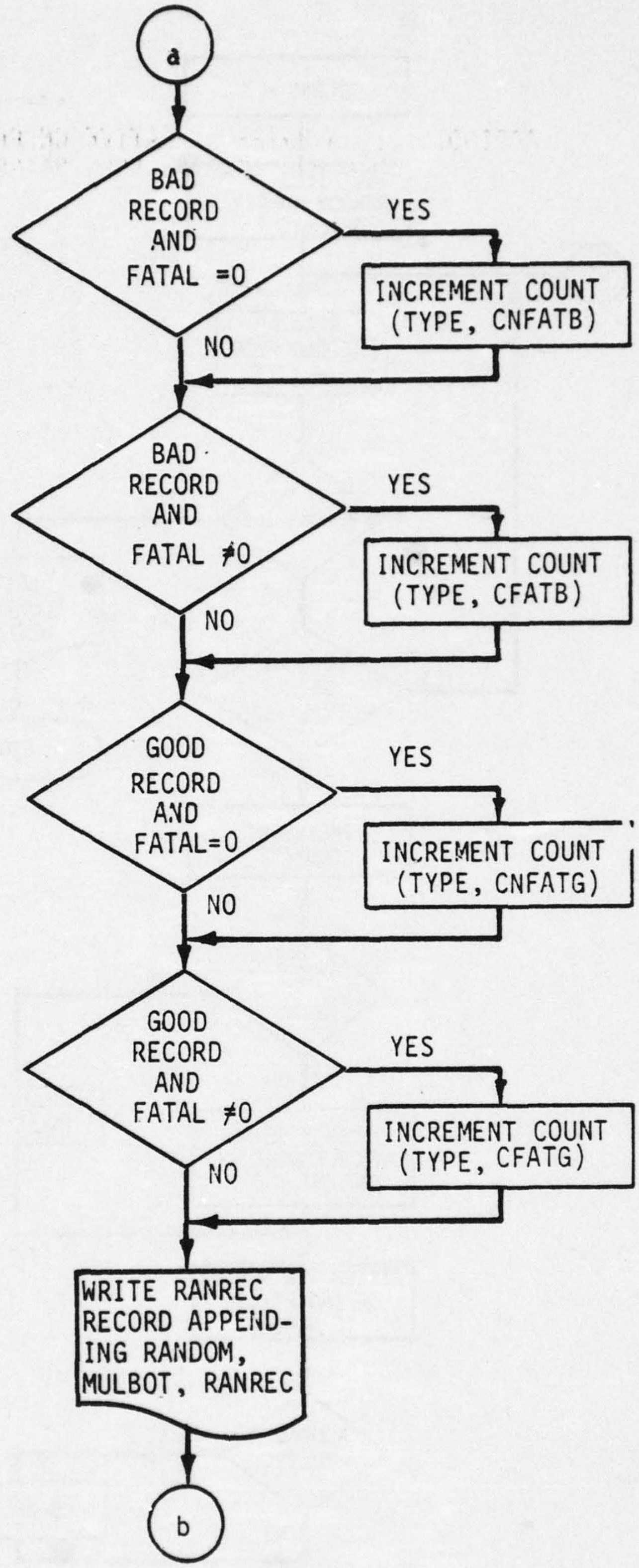


FIGURE H-1. FLOW DIAGRAM FOR PROGRAM PASS1 (concluded)

APPENDIX I. A BRIEF NARRATIVE ON PROGRAM SELECT AND CORRESPONDING FLOW DIAGRAM*

The SELECT program is used to interactively choose the number of records to be selected from each category and perform the actual selection. Input to the program consists of the workfile (WRKFIL) produced in PASS1 as well as the BAR file (SORTED) sorted by the random number attached to the records in PASS1. The program then asks the user to enter the number of records to be selected from a particular category. The percentage of the number of records requested out of the number in the category is calculated and printed. For each type of accident within the category, the percentage is applied to the total number of records of a type yielding the number of records that should be selected from that type. This number is then halved to select an equal number of fatal and non-fatal accidents. When selection occurs, good records (missing information does not exceed set tolerance) are taken until either the quota is filled or there are no more good records to be selected. In the latter case, the remaining records are made up by selecting bad records. A summary of the records that will be selected for the category is printed along with the actual sample size. The actual sample size may vary from the requested sample size when there are many fatal accidents but few non-fatal accidents or vice versa. This occurs because the quota for non-fatal and fatal accidents is based on the total number of accidents in a type. If one of these classifications (fatal or non-fatal) contributes greatly to the total and very few accidents are of the other classification, then an equal number of records cannot be selected. A large population size and a relatively small sample size will reduce the effects of this situation. After the summary is printed for the category, the user is allowed to change the number of records to be selected from that category or move on to the next one.

When the user has entered the frequencies for all four categories, the actual selection of the records takes place. This is accomplished by reading a record and determining its classification (fatal accident-good record, fatal accident-bad record, etc.). If the quota for the classification has not been filled,

---

* The program specifications and capabilities were prepared by the Control Data Corporation and the support staff at the Atlanta, GA facility.

the record is written to the sample file and the appropriate quota is decremented. If the serial number of the current record is the same as the previous record, the record is assumed to be one of a multiple boat accident. All records of the accident are read and if there is a need to select any one of them, they are all selected. The selection process continues until there are no more quotas to be filled.

Output from this program includes the category-by-category summary of the records that have been selected plus a a global summary of the sample when the selection phase is complete. The selected records are written to the file called "SAMPLE" and are in the same format as they were before the PASS1 program (e.g., the bad record flag, multiple boat accident flag, and random number fields are removed). Flow diagrams of the SELECT program and of the QUOTA subroutine are shown in Figures I-1 and I-2, respectively.

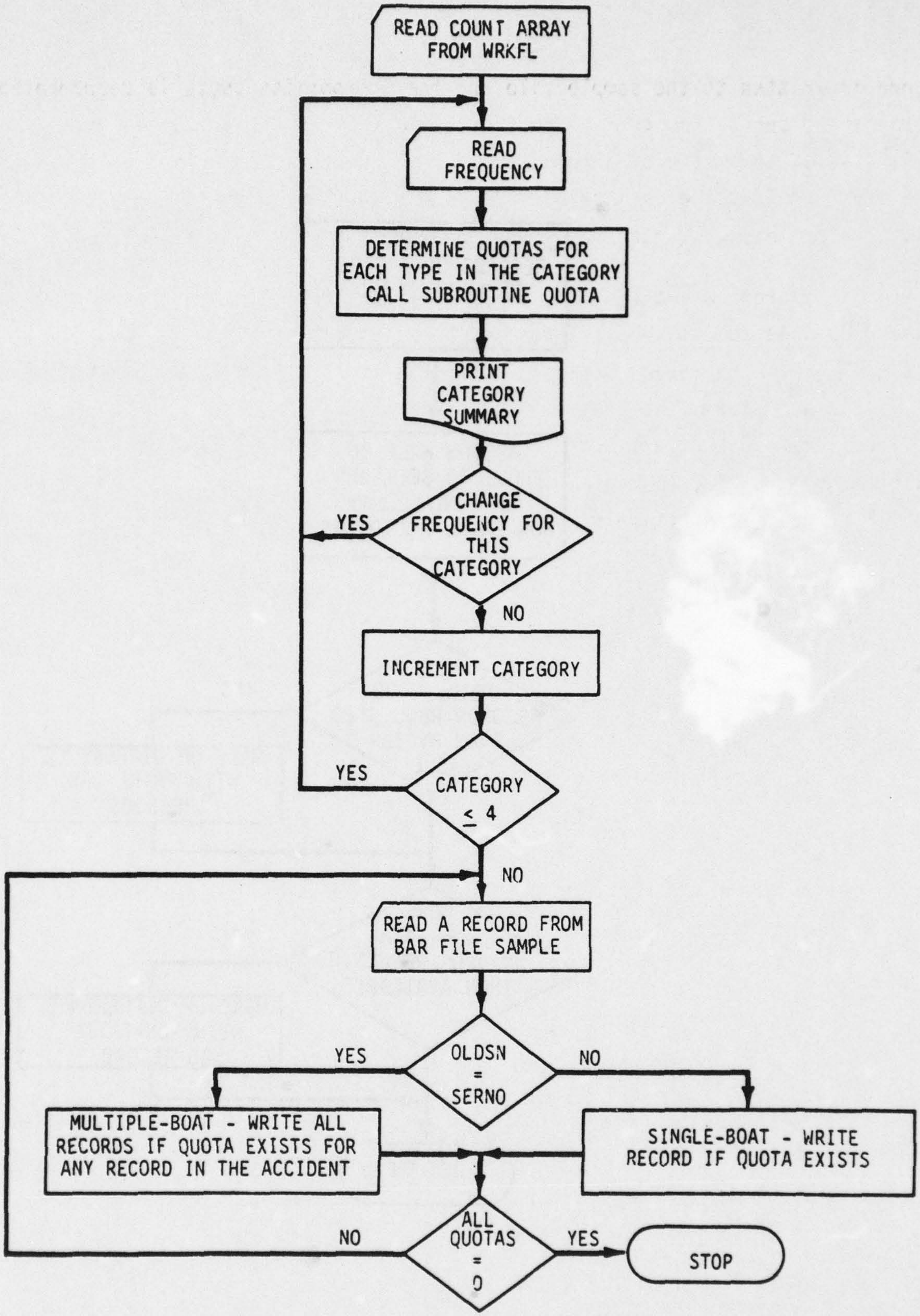


FIGURE I-1. FLOW DIAGRAM FOR PROGRAM SELECT

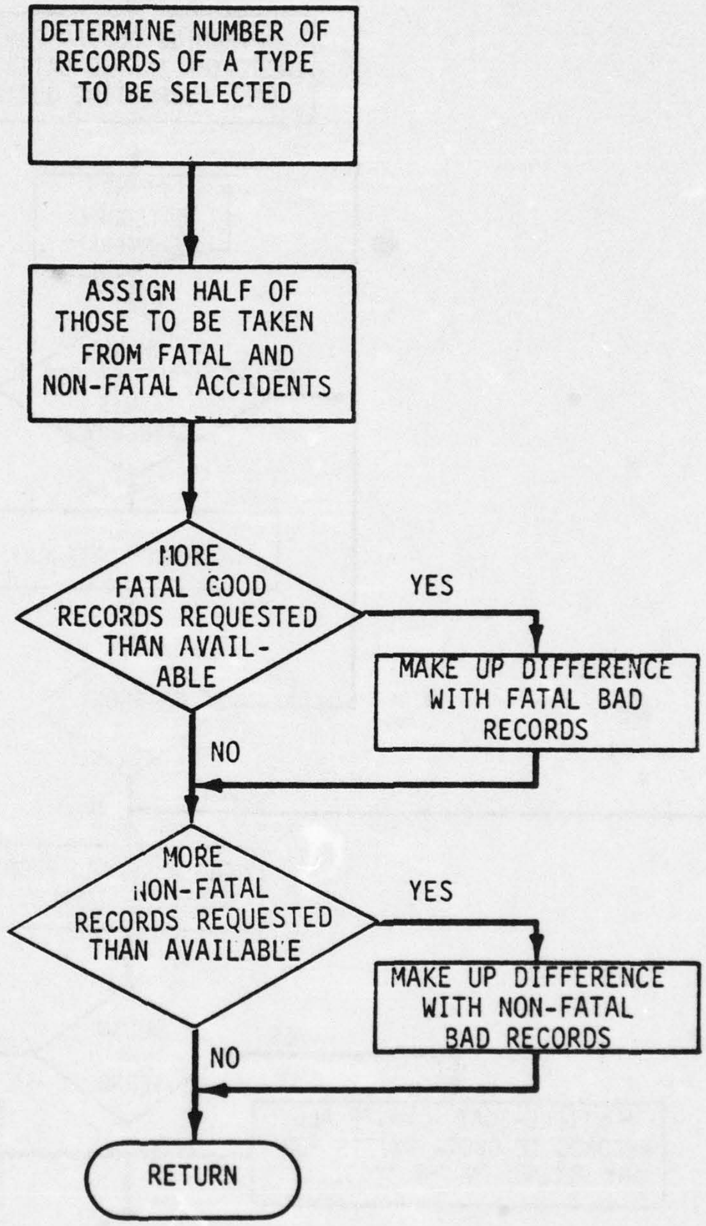


FIGURE I-2. FLOW DIAGRAM FOR SUBROUTINE QUOTA

APPENDIX J. RBSEM CODING INSTRUCTIONS

INTRODUCTION

These instructions are for use during the coding of accident data for the Recreational Boating Safety Education Methodology (RBSEM). This encoding procedure involves taking information about various accidents from the USCG recreational boating accident files, and then generating certain additional information items. This process is necessarily based partly on judgment and subjective interpretation of the data. For this reason, it is important that the RBSEM coders have some knowledge of boating and/or experience in dealing with accident data. Coders are also urged to work thoughtfully and with care. The results of the effort will become the basis for statistics used in the determination of USCG boating safety education programs.

Table J-1 provides a summarized overview of the various procedures to be performed for each accident case by the coder. Input computer printouts contain special blanks for the coders' interpretation. After coding is finished, similar printouts with the augmented information will be taken by keypunch personnel and entered into the RBSEM data file. This file will then be used to guide the development of boating safety education programs.

Please read over the entire instructions before you begin your coding task and familiarize yourself with them. When you begin, start with the first accident in your group of accidents, and go through all five coding operations, in order. Do the same for all the accidents in your sample.

Operation One - Verify and Complete Given Information

To begin, put your initials in the top right-hand corner of the computer printout, under the case serial number (see example, Appendix K). Then proceed with verification of the information.

- Check the accident serial number. The first five digits should correspond to the number on the BAR.

TABLE J-1. TASKS TO BE PERFORMED BY THE CODER

STEPS (Operations)	INPUT (Materials Needed)	TASK DESCRIPTION	OUTPUT
Operation One	Computer printout from USCG accident file (see example, Appendix K) BAR and accompanying documents. USCG accident file coding information (Appendices L&M)	Review, verify, and complete the given information on the first three sections of the computer printout. Fill in self-evident information which may have been omitted on BAR and/or printout.	Factually accurate data on the first three sections of the computer printout.
Operation Two	Computer printout from USCG accident file. BAR and accompanying documents. Cause analysis trees (Appendix A)	Trace accident through appropriate cause analysis tree.	Code entered into "Established Code" spaces or unique cause in "New Initiator/Cause."
Operation Three	Computer printout from USCG accident file. BAR and accompanying documents. Coding instructions for Associated factors (Appendix E)	Identify associated factors which probably played a role in the accident.	Checkmark beside appropriate factor(s) and/or description of "other" associated factor.
Operation Four	Computer printout from USCG accident file. BAR and accompanying documents. Operator alternatives (Appendix D)	Identify alternative behaviors which might have avoided or reduced the severity of the accident.	Code(s) for up to five alternatives and/or 20 character description of "other" alternative.
Operation Five	Computer printout from USCG accident file. BAR and accompanying documents. Example edit sheets for descriptive accident scenario (see example, Appendix N)	Generate a scenario of up to 600 characters in length describing the major aspects of the accident.	Verbal description filled into the spaces provided for "Descriptive Scenario of Accident."

- Check the data on the printout.against the information given on the BAR and its attachments. Read over the BAR (and any additional attached forms, such as an MIO report or coroner's report). If there are discrepancies, correct the printout. If information is present in the BAR materials which has not been recorded on the printout, or if additional information can be inferred with a high degree of confidence from what is said, then add these data to the BAR.

The top part of the page contains 17 "education variables" divided into two general categories: Operator of Boats Involved in Accident and Accident Information for Boat, Personnel, and Conditions. The value for each of these variables is printed out on the page beside its name (for example, in Appendix K, the sample printout sheet, the variable "Operator Age" has a value of 31 years). Appendix L contains the coding instructions used for the initial coding of accidents when they are entered into the USCG master file. Below this is a third category: Additional Accident Information. Values for these 30 variables appear on the printout in the coded form as it occurs in the USCG master file. Code descriptors are contained in Appendix M.

Operation Two - Identify Accident Initiator

The first item of new information for you to fill in is the initiator or cause of the accident. Table J-2 gives the location of the cause analysis instrumentation. To determine the initiator, you should take note of the "Type of Accident" listed in the second group of education variables, in the right-hand column (in the sample in Appendix K, the accident type is Collision with Fixed Object). In cases where an accident is the result of a chain of accident events, it should have been coded according to the first accident that occurred. For example, if the boat operator fell down within the boat, causing the boat to go out of control, resulting in a collision, that accident should be in the category "Falls Within the Boat." If you should come across an accident which you feel has been categorized in the wrong accident group, consult the education analyst working on the project. At his direction, a new case may be sampled to replace the questionable one.

Appendices A-1 through A-15 contain the cause analysis instrumentation to identify accident initiators (for the different accident types). Choose the appropriate tree, and using all of the information available to you, trace the accident through the tree as far as you can, reading the descriptions which define the

TABLE J-2. ACCIDENT TYPES AND LOCATION OF INSTRUMENTATION FOR CAUSE IDENTIFICATION ANALYSIS

Accident Type	Appendix Containing Cause Analysis Tree	Appendix Containing Verbal Descriptor
Collisions		
Groundings Collisions with Another Vessel Collisions with Fixed Objects Collisions with Floating Objects	A-1	A-2
Loading Related Accidents		
Capsizings Swamping/Floodings Sinkings	A-3	A-4
Falls Overboard	A-5	A-6
Fires and/or Explosions		
Fires and/or Explosions of Fuel	A-7	A-9
Fires and/or Explosions Other than Fuel	A-10	A-11
Other Categories of Accidents		
Falls by Persons Within the Boat	A-12	A-13
Persons Hit by Boat or Propeller	A-14	A-15

*Special instructions for coding the fires and/or explosions of fuel accidents are presented in Appendix A-8.

various choices. This is very important, since certain terms with which you are familiar may have specialized meanings for the purpose of this accident initiator identification. In some cases, you may have to make inferences from the information given. It is preferable for you to venture an educated guess, based on your common sense and your knowledge of boating, than to code the cause as unknown. Something went wrong, or there would not have been an accident. From what you know, what is the most likely cause? However, if no information is available at all, then do code it as unknown. Take the accident as far down through the selected tree as you can. In some cases, there will be sufficient detail present to identify the specific cause/condition at the lowermost level. In other cases, you may not be able to proceed far beyond initial nodes.

Notice that there is a code number associated with each point in the trees. This code is used to identify the initiator for the accident. Fill in the code for this accident cause in the blank on the computer sheet labeled "Established Code." For those cases where the accident does not fit any of the causes spelled out in the tree, and you code it into a node labeled "Other," there is a 20-blank space provided to write in the cause, in the blank labeled "New Initiator/Cause."

Operation Three - Identify Associated Factors

In Operation Two, you determined the initiator which caused the accident. There is also a group of events, conditions, etc., that seem to be reported by boaters with some reliability; but the relationship between those factors and the accidents is less certain, or is indirect. These are factors which are linked to the accidents only by inference and association rather than by a clear cause and effect connection. Appendix E contains a list of the most common associated factors and their descriptions. Please read the instructions for Appendix E before proceeding with the analysis. Mark the space(s) beside the appropriate factor(s) on the computer printout for those conditions which you judge to have been associated with this accident. If you can identify a behavior, condition, or event which you feel contributed to the occurrence of the accident in a similar manner, but which is not included in the list of factors given, enter a short description of that factor in the 20-blank space beside the designation "99-Other."

Operation Four - Determine Operator Alternatives

Following the occurrence of an accident, it is usually possible to offer an alternative behavior which, in retrospect, you think could have prevented, or reduced the severity of, that accident. From the information available, you should now attempt to determine exactly what the operator of the boat involved in the accident could have done to avoid the accident, and/or to reduce the severity of the consequences after the accident had occurred: *what he should have done or what he should have known.* This may include alternative behavior for persons on board other than the operator. The alternative action or decision which you offer should be plausible and consistent with the conditions in which the accident occurred. If the operator behaved appropriately, but was not successful in avoiding the accident, go ahead and list that behavior as an alternative. You may include more than one alternative if they are readily apparent. The alternatives will very likely fall into the following categories:

- pre-accident behavior or avoidance of conditions in which such accidents tend to occur (e.g., "allow for safe distances between boats").
- how to handle the operation of the boat in such a way that the accident does not occur (e.g., "don't smoke while fueling").
- how to stabilize the crisis after the accident has occurred (e.g., "remain with the capsized boat").
- how to prevent fatalities after the accident has occurred (e.g., "wear PFD if non-swimmer, young child, or elderly").

Appendices D-1 through D-8 contain lists of operator alternatives which have been identified in previous accident analyses. They are listed by accident type (the same accident classifications which were used for identifying the accident cause/initiators, except that here capsizings are represented in a list separate from swampings, floodings and sinkings). Turn to the list corresponding to the accident category for the accident on which you are working. The information you need for locating this list is in Table J-3. Register the appropriate code number(s) in the blanks provided on the computer printout in the order of their importance as you see it. If you identify a behavior which you feel could have

avoided or minimized the severity of the accident, and which is not included in the list, write it into the space provided (20 blanks beside the category no. 6: "999-Other."

TABLE J-3. ACCIDENT TYPES AND LOCATION OF OPERATOR ALTERNATIVES

ACCIDENT TYPE	APPENDIX CONTAINING OPERATOR ALTERNATIVES
Collisions	
Groundings	D-1
Collisions with Another Vessel	D-1
Collisions with Fixed Objects	D-1
Collisions with Floating Objects	D-1
Loading Related Accidents	
Capsizings	D-2
Swamping/Floodings, and Sinkings	D-3
Falls Overboard	D-4
Fires and Explosions	
Fires and/or Explosions of Fuel	D-5
Fires and/or Explosions Other Than Fuel	D-6
Other Categories of Accidents	
Falls by Persons Within the Boat	D-7
Persons Hit by Boat or Propeller	D-8

Operation Five - Prepare Accident Scenario

Finally, there is a section at the bottom of the printout which provides 600 blank spaces for an accident summary (scenario). This may include events leading up to the accident, a description of important aspects of the accident itself, and what happened subsequent to the initial accident if it bears on the outcome, such as a death. Emphasis should be on specifying the major facts that contributed to the accident and/or made it unavoidable. Note events in a way that identifies the sequence in which they occurred. One blank should be left between each word and numbers may be included in the write-up. This summary may be shorter than 600 characters. At the end of a line, break words into syllables in a manner similar to the procedure followed when typing. The scenario which you write will become part of the computer record for the accident, and will be retrieved in the form in which you have written it for use in RBSEM education programs. You should write one practice scenario on the special practice sheets provided (see example, Appendix N) before filling the spaces on the computer record.

APPENDIX K. SAMPLE COMPUTER PRINTOUT FOR RBSEM CODER USE

```
PAGE NO   18                                                                CASE SERIAL NUMBER =  04316 0127
                                 RECREATIONAL BOATING SAFETY EDUCATION METHOD    . CASE DATA IS COMPLETE
*** OPERATOR OF BOATS INVOLVED IN ACCIDENT  ***

      AGE OF OPERATOR = 31    HOURS OF BOATING EXPERIENCE = OVER 500 HRS        FORMAL BOATING INSTRUCTION = NONE

*** ACCIDENT INFORMATION FOR BOAT, PERSONNEL, AND CONDITIONS  ***

          CASE SERIAL NUMBER....=   04316 0127                 SEA TEMPERATURE...............=  70-79
          TYPE OF BOAT..........=   OPEN MOTORBOAT             TYPE OF ACCIDENT..............=  COLLISION-FIXED OBJ
          LENGTH OF BOAT........=   17                         NUMBER OF DROWNINGS...........=  NONE
          DATE OF ACCIDENT......=   09/10/76                   NUMBER OF OTHER VICTIMS.......=  1
          TYPE OF BODY OF WATER =   LAKES-PONDS                NUMBER OF INJURIES............=  NONE
          STATE.................=   00                         AMT. OF PROPERTY DAMAGE.......=  000
          WATER CONDITIONS......=   CALM                       ACTIVITY AT TIME OF ACCIDENT =   WATER SKIING

*** ADDITIONAL ACCIDENT INFORMATION  ***

          JURISDICTION..........=   1                          ACCIDENT TYPE 3...............=  00
          RENTED BOAT...........=   2                          PERSONAL FLOTATION DEVICES....=  1
          PERSONS ONBOARD.......=   01                         NUMBER OF VESSELS INVOLVED....=  1
          MANUFACTURER CODE.....=   000                        ACCIDENT CAUSE 1..............=  98
          HULL MATERIAL.........=   4                          ACCIDENT CAUSE 2..............=  -0
          PROPULSION............=   1                          ACCIDENT CAUSE 3..............=  -0
          HORSEPOWER............=   070                        ACCIDENT DESCRIPTOR 1.........=  43
          YEAR BOAT BUILT.......=   66                         ACCIDENT DESCRIPTOR 2.........=  -0
          TIME OF ACCIDENT......=   13                         ACCIDENT DESCRIPTOR 3.........=  -0
          COUNTY................=   015                        ACCIDENT DESCRIPTOR 4.........=  97
          DISTRICT..............=   08                         JULIAN DATE...................=  227
          WEATHER CONDITION.....=   1                          DAY OF THE WEEK...............=  3
          WIND CONDITION........=   1                          FATALITIES....................=  1
          VISIBILITY............=   1                          NUMBER OF ACCIDENTS
          ACCIDENT TYPE 2.......=   00                           BY FRACTION METHOD..........=  9

*** ACCIDENT INITIATORS/CAUSES  (ENTER ESTABLISHED CODE OR NEW INITIATOR/CAUSE)  ***

          ESTABLISHED CODE (___)      OR      NEW INITIATOR/CAUSE  (999) I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I

*** FACTORS ASSOCIATED WITH ACCIDENTS  (ENTER -X- BY SELECTED FACTORS AND/OR ENTER NEW FACTOR)  ***

          01 OPERATOR ALCOHOL CONSUMPTION     (  )   02 OPERATOR FATIQUE      (  )   03 GLARE             (  )
          04 EXCESSIVE SHOCK/VIBRATION, NOISE (  )   05 OPERATOR INATTENTION  (  )   06 EXCESSIVE SPEED   (  )
          07 RECKLESS OR MALICIOUS OPERATION  (  )   99 OTHER  I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I

*** OPERATOR ALTERNATIVES TO PREVENT ACCIDENT (ENTER ALTERNATIVE CODES AND/OR NEW ALTERNATIVE)  ***

          1  ___                    2  ___                      3  ___
          4  ___                    5  ___                      6  999 OTHER   I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I

*** DESCRIPTIVE SCENARIO OF ACCIDENT (ENTER UP TO 60 CHARACTERS ON EACH LINE USED)  ***

011060127AI_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I
011060127BI_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I
011060127CI_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I
011060127DI_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I
011060127EI_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I
011060127FI_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I
011060127GI_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I
011060127HI_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I
011060127II_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I
011060127JI_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I_I
```

APPENDIX L. CODING INFORMATION USED FOR USCG ACCIDENT FILES FOR EDUCATION VARIABLES

EDUCATION VARIABLES	CODING INFORMATION	
Operator of Boat(s) Involved in Accident		
Age of Operator	Code age prefixing a zero if age is less than 10.	
	No operator	code 00
	Age unknown	code 99
Hours of Boating Experience	Code only for "this type of boat."	
	No operator	0
	Under 20 hrs	1
	20-100 hrs	2
	101-500 hrs	3
	Over 500 hrs	4
	Unknown	9
Formal Instruction in Boating Course (name of course taken)	No operator	0
	USCG Auxiliary	1
	U.S. Power Squadron	2
	American Red Cross	3
	State	4
	None	5
	Other	6
	Unknown	9
Accident Information for Boat, Personnel, and Conditions		
Case Serial Number	Assigned serial number as per current BLC policy.	
Type of Boat(s) (e.g., Open Motorboat)	Open Motorboat	1
	Cabin Motorboat	2
	Auxiliary Sail	3
	Sail Only	4
	Rowboat	5
	Canoes/Kayaks	6
	Inflatables	7
	Houseboat	8
	Other	0
	Unknown	9
Length of Boat(s)	Round to nearest foot, code directly. If less than 10, prefix with 0.	
	98 ft or over	98
	Unknown	99

APPENDIX L. (continued)

Date of Accident	Month (prefix 0 if less than 10) Year (code last digit in year only) Unknown 99
Type of Body of Water	Ocean/Gulf 1 Great Lakes (not tributaries) 2 Bays, inlets, sounds harbors, inter-coastal waterways 3 Rivers, streams, creeks 4 Lakes, ponds, reservoirs, dams, gravel pit 5 Other 6 Unknown 9
State	If on high seas, code state boat registered in. Use standard postal two-letter codes.
Water Conditions	Calm 1 Choppy 2 Rough 3 Very rough 4 Strong current 5 Unknown 9
Sea Temperature	Below 30°F 1 31-39 2 40-49 3 50-59 4 60-69 5 70-79 6 80-89 7 90 and above 8 Unknown 9
Operation of Boat at Time of Accident	Cruising 10 " Fishing 11 " Hunting 12 " Sailing 13 Maneuvering 20 " Docking 21 " Undocking 22 " Mooring 23 " For Towing 24

APPENDIX L. (continued)

Operation of Boat at Time of Accident (continued)	Water skiing	30
	" Maneuvering w/skier down	31
	Racing	40
	Towing	50
	" being towed	51
	Drifting	60
	" Fishing	61
	" Hunting	62
	" Diving or Swimming	63
	" Fueling	64
	At Anchor	70
	" Fishing	71
	" Hunting	72
	" Diving or Swimming	73
	" Fueling	74
	Tied to dock	80
	" Fueling	81
	Other	98
	Unknown	99
Type of Accident	Examine all accident types and choose all which are applicable (if more than three, pick three most important). Code in the order the accident occurred. RBSEM will use the first accident type in coded order. If multi-vessel accident, code common element.	
	Grounding	01
	Capsizing	02
	Swamping/Flooding	03
	Sinking	04
	Fire/Explosion (Fuel)	05
	Fire/Explosion (Other)	06
	Collision w/another vessel	07
	Collision w/fixed object	08
	Collision w/floating object	09
	Falls Overboard	10
	Falls within Boat	11

APPENDIX L. (concluded)

Type of Accident (concluded)	Struck by Boat or Propeller 12 Other 93 Unknown 99 None 00
Amount of Property Damage	Code in units of $100 (prefix with 0s if necessary). If less than $100, do not code; if over $100, round to nearest $100. Include only damage to this vessel. Unknown 00000
Number of Drownings	Code directly (this vessel only) None or Unknown 0 9 or greater 9
Number of Other Victims	Do not count those coded as "number of drownings." Code directly (this vessel only). None or Unknown 0 9 or greater 9
Number of Injuries	(Persons receiving medical treatment or incapacitated more than 24 hours). Code total number of injured (this vessel only). None or Unknown 0 9 or greater 9

APPENDIX M. CODE DESCRIPTORS USED FOR USCG ACCIDENT FILE INFORMATION FOR VARIABLES IN THE CATEGORY "ADDITIONAL ACCIDENT INFORMATION"

Variable Label		Code Descriptors
Jurisdiction	1	Joint CG-State
	2	Exclusive State
	0	None
Rented Boat	1	Yes
	2	No
	9	Unknown
Persons On Board	00	None
	99	Unknown
Manufacturer Code*	UUU	Unknown
Hull Material	1	Wood
	2	Aluminum
	3	Steel-Metal
	4	Fiberglass
	5	Rubber-Vinyl-Canvas
	6	Other
	9	Unknown
Propulsion	1	Outboard
	2	Inboard Gasoline
	3	Inboard Diesel
	4	Inboard-Outdrive
	5	Jet
	6	Sail
	7	Manual
	8	Other
	9	Unknown
Horsepower	0	None
	999	Unknown
Year Boat Built	99	Unknown
Time of Accident	99	Unknown
County**	999	Unknown
District	0	None

* Hull identification number

** GSA code

APPENDIX M. (continued)

Variable Label		Code Descriptors
Weather Condition	1	Clear
	2	Cloudy
	3	Fog
	4	Rain
	5	Snow
	6	Hazy
	9	Unknown
Wind Condition	0	None
	1	Light
	2	Moderate
	3	Strong
	4	Storm
	9	Unknown
Visibility	1	Good
	2	Fair
	3	Poor
	4	Dark
	9	Unknown
Accident Type (1, 2, and 3)	0	None
	1	Grounding
	2	Capsizing
	3	Swamping-Flooding
	4	Sinking
	5	Fire-Explosion-Fuel
	6	Fire-Explosion-Other
	7	Collision-Vessel
	8	Collision-Fixed Object
	9	Collision-Float Object
	10	Falls-Overboard
	11	Falls in Boat
	12	Struck-Boat or Prop
	98	Other
	99	Unknown
Personal Flotation Devices	0	No PFDs
	1	Adequately equipped with approved PFDs-Accessible-Used
	2	App-Acc-Not Used
	3	App-Not Acc
	4	Not App-Acc-Used
	5	Not App-Acc-Not Used
	6	Not App-Not Acc
	7	Other
	9	Unknown

APPENDIX M. (continued)

Variable Label		Code Descriptors
Number of Vessels Involved	9	9 or Greater
	0	None
Accident Cause (1, 2, and 3)	1	Overloading
	2	Improper Wt Distribution
	3	Standing
	4	Movement
	5	Handling Anchor
	6	Water Entered Over
	7	Water Entered Thru
	8	Wake or Wave
	9	High Speed Loss Stab
	10	Strong Current Loss
	11	Fuel System
	12	Electrical System
	13	Aux Equipment
	14	Ignition Fuel
	15	Misuse Source Heat
	16	Fall During Turn-Acc
	17	Wave or Wake
	18	Fall While Moving-Le
	19	Improper Sitting
	20	Slippery Surface
	21	Improper Lookout
	22	Poor Visibility
	23	View Obstructed
	24	Submerged Object
	25	Operator Carelessness
	26	Equipment Failure
	27	Rules of Road
	28	Speeding
	29	Improper Lights
	30	Start In Gear
	31	Navigation Error
	32	Other Vessel at Fault
	33	Strong Current
	98	Other
	99	Unknown

APPENDIX M. (concluded)

Variable Label		Code Descriptors
Accident Descriptor (1, 2, 3, and 4)	1	Not Reach Fire Ext
	2	Fought Fire
	3	No Fire Ext
	4	Could Not Reach PFD
	5	Trapped Under Boat
	6	Put PFD On In Water
	7	Exposure-Shock-Hypo
	8	Clung to Boat
	9	Could Not Hold
	10	Could Not Right Boat
	11	Left Boat-Swam
	12	Injured Entering Wat
	13	Exhaustion-No Swim
	14	Alcohol or Drugs
	15	Runaway Boat
	16	Upright Drifting
	17	Capsized
	18	Distress Signals
	19	Out of Fuel
	20	Assisted Others
	21	Help Nearby
	22	CG Involved
	23	Over the Dam
	24	No Witnesses
	25	Lightning-Power Cabl
	26	Medical
	27	White Water
	28	Standing While Start
	29	Bad Mooring
	30	Heavy Surf
	31	Swimmer or Diver
	32	No Audio Device
	33	No Comms
	34	No Anchor
	35	No Bailer
	36	Hit and Run
	37	Wake
	38	Ventilation
	39	Navigational Aid
	40	Entangled in Lines
	41	Inner Tubes
	42	Congested Area
	43	Water Skiing
	44	Carbon Monoxide
	95	Op-Fault Unknown
	96	Op-Fault
	97	No Op-Fault
	98	Administrative Recor

APPENDIX N. EDIT SHEET FOR DESCRIPTIVE SCENARIO OF ACCIDENT

(Space for Three Practice Runs)

A
B
C
D
E
F
G
H
I
J

A
B
C
D
E
F
G
H
I
J

A
B
C
D
E
F
G
H
I
J

APPENDIX O. EDUCATION POTENTIAL FOR ACCIDENT INITIATORS

This appendix is a guide to determining the potential for education of recreational boaters on any given accident initiator in the RBSEM cause analysis instrumentation. The code numbers associated with the initiators are presented in this guide along with their respective potential for education. These are the code numbers from the cause analysis trees which appear in Appendices A-1 through A-15. The initiator codes are listed in ascending order from 001 to 425. To the right of each initiator code number, you will find one of the three possible alternatives for education potential.

- potential for education is likely ....(LIKELY)
- potential for education is uncertain and review of the individual accident report is required ....(UNCERTAIN)
- potential for education is unlikely ....(NONE)

In the event that you find an accident initiator that does not seem to fit the suggested alternative, consider that initiator on an individual basis in terms of what you know about the accident from the report. Remember, this list is only a guide and will very likely require updating and revision as time goes on.

Initiator Code	Alternative for Education Potential	Initiator Code	Alternative for Education Potential
001	UNCERTAIN	011	NONE
002	UNCERTAIN	012	LIKELY
003	UNCERTAIN	013	UNCERTAIN
004	LIKELY	014	UNCERTAIN
005	LIKELY	015	UNCERTAIN
006	LIKELY	016	UNCERTAIN
007	LIKELY	017	UNCERTAIN
008	NONE	018	UNCERTAIN
009	LIKELY	019	LIKELY
010	LIKELY	020	LIKELY

Initiator Code	Alternative for Education Potential	Initiator Code	Alternative for Education Potential
021	LIKELY	054	LIKELY
022	LIKELY	055	UNCERTAIN
023	LIKELY	056	LIKELY
024	UNCERTAIN	057	LIKELY
025	UNCERTAIN	058	LIKELY
026	LIKELY	059	LIKELY
027	LIKELY	060	LIKELY
028	LIKELY	061	LIKELY
029	LIKELY	062	LIKELY
030	LIKELY	063	LIKELY
031	LIKELY	064	LIKELY
032	LIKELY	065	UNCERTAIN
033	LIKELY	066	LIKELY
034	LIKELY	067	LIKELY
035	UNCERTAIN	068	LIKELY
036	UNCERTAIN	069	LIKELY
037	LIKELY	070	LIKELY
038	UNCERTAIN	071	UNCERTAIN
039	LIKELY	072	UNCERTAIN
040	UNCERTAIN	073	UNCERTAIN
041	UNCERTAIN	074	UNCERTAIN
042	UNCERTAIN	075	UNCERTAIN
043	LIKELY	076	UNCERTAIN
044	LIKELY	077	LIKELY
045	LIKELY	078	LIKELY
046	LIKELY	079	LIKELY
047	LIKELY	080	LIKELY
048	LIKELY	081	UNCERTAIN
049	LIKELY	082	UNCERTAIN
050	LIKELY	083	UNCERTAIN
051	LIKELY	084	UNCERTAIN
052	LIKELY	085	LIKELY
053	LIKELY	086	LIKELY

Initiator Code	Alternative for Education Potential	Initiator Code	Alternative for Education Potential
087	LIKELY	120	LIKELY
088	LIKELY	121	LIKELY
089	UNCERTAIN	122	UNCERTAIN
090	LIKELY	123	LIKELY
091	LIKELY	124	LIKELY
092	LIKELY	125	LIKELY
093	LIKELY	126	LIKELY
094	LIKELY	127	LIKELY
095	LIKELY	128	LIKELY
096	LIKELY	129	UNCERTAIN
097	LIKELY	130	LIKELY
098	UNCERTAIN	131	LIKELY
099	LIKELY	132	LIKELY
100	LIKELY	133	LIKELY
101	LIKELY	134	LIKELY
102	LIKELY	135	LIKELY
103	LIKELY	136	UNCERTAIN
104	LIKELY	137	LIKELY
105	LIKELY	138	LIKELY
106	UNCERTAIN	139	LIKELY
107	LIKELY	140	LIKELY
108	LIKELY	141	LIKELY
109	LIKELY	142	LIKELY
110	LIKELY	143	LIKELY
111	LIKELY	144	UNCERTAIN
112	LIKELY	145	LIKELY
113	LIKELY	146	LIKELY
114	UNCERTAIN	147	LIKELY
115	LIKELY	148	LIKELY
116	LIKELY	149	LIKELY
117	LIKELY	150	LIKELY
118	LIKELY	151	UNCERTAIN
119	LIKELY	152	LIKELY

Initiator Code	Alternative for Education Potential	Initiator Code	Alternative for Education Potential
153	LIKELY	186	UNCERTAIN
154	LIKELY	187	UNCERTAIN
155	LIKELY	188	UNCERTAIN
156	LIKELY	189	UNCERTAIN
157	LIKELY	190	UNCERTAIN
158	UNCERTAIN	191	UNCERTAIN
159	UNCERTAIN	192	UNCERTAIN
160	LIKELY	193	UNCERTAIN
161	LIKELY	194	UNCERTAIN
162	LIKELY	195	UNCERTAIN
163	LIKELY	196	UNCERTAIN
164	LIKELY	197	UNCERTAIN
165	LIKELY	198	UNCERTAIN
166	LIKELY	199	UNCERTAIN
167	UNCERTAIN	200	UNCERTAIN
168	LIKELY	201	UNCERTAIN
169	LIKELY	202	UNCERTAIN
170	LIKELY	203	UNCERTAIN
171	LIKELY	204	UNCERTAIN
172	LIKELY	205	LIKELY
173	LIKELY	206	LIKELY
174	UNCERTAIN	207	LIKELY
175	LIKELY	208	LIKELY
176	LIKELY	209	LIKELY
177	LIKELY	210	LIKELY
178	LIKELY	211	LIKELY
179	LIKELY	212	UNCERTAIN
180	LIKELY	213	LIKELY
181	UNCERTAIN	214	LIKELY
182	UNCERTAIN	215	LIKELY
183	UNCERTAIN	216	LIKELY
184	UNCERTAIN	217	LIKELY
185	UNCERTAIN	218	LIKELY

AD-A071 397 WYLE LABS HUNTSVILLE ALA F/G 13/10
RECREATIONAL BOATING SAFETY EDUCATION METHODOLOGY (RBSEM).(U)
APR 79 E SAGER, K GEISSLER, K REDICK, S COHEN DOT-CG-73433-A
UNCLASSIFIED MSR-79-01 USCG-D-37-79 NL

4 OF 4
AD
A071397

END
DATE
FILMED
8-79
DDC

Initiator Code	Alternative for Education Potential	Initiator Code	Alternative for Education Potential
219	UNCERTAIN	252	LIKELY
220	LIKELY	253	LIKELY
221	LIKELY	254	LIKELY
222	LIKELY	255	LIKELY
223	LIKELY	256	LIKELY
224	LIKELY	257	UNCERTAIN
225	LIKELY	258	LIKELY
226	UNCERTAIN	259	LIKELY
227	UNCERTAIN	260	LIKELY
228	UNCERTAIN	261	LIKELY
229	UNCERTAIN	262	LIKELY
230	UNCERTAIN	263	LIKELY
231	UNCERTAIN	264	UNCERTAIN
232	UNCERTAIN	265	LIKELY
233	UNCERTAIN	266	LIKELY
234	UNCERTAIN	267	LIKELY
235	UNCERTAIN	268	LIKELY
236	UNCERTAIN	269	LIKELY
237	UNCERTAIN	270	LIKELY
238	UNCERTAIN	271	UNCERTAIN
239	UNCERTAIN	272	LIKELY
240	UNCERTAIN	273	LIKELY
241	UNCERTAIN	274	LIKELY
242	UNCERTAIN	275	LIKELY
243	UNCERTAIN	276	LIKELY
244	UNCERTAIN	277	LIKELY
245	UNCERTAIN	278	LIKELY
246	UNCERTAIN	279	UNCERTAIN
247	UNCERTAIN	280	LIKELY
248	UNCERTAIN	281	LIKELY
249	LIKELY	282	LIKELY
250	LIKELY	283	LIKELY
251	LIKELY	284	LIKELY

Initiator Code	Alternative for Education Potential	Initiator Code	Alternative for Education Potential
285	LIKELY	318	LIKELY
286	UNCERTAIN	319	LIKELY
287	LIKELY	320	LIKELY
288	LIKELY	321	LIKELY
289	LIKELY	322	UNCERTAIN
290	LIKELY	323*	LIKELY
291	LIKELY	324	LIKELY
292	LIKELY	325	LIKELY
293	UNCERTAIN	326	LIKELY
294	LIKELY	327	LIKELY
295	LIKELY	328	LIKELY
296	LIKELY	329	LIKELY
297	LIKELY	330	UNCERTAIN
298	LIKELY	331	LIKELY
299	LIKELY	332	LIKELY
300	LIKELY	333	LIKELY
301	UNCERTAIN	334	UNCERTAIN
302	LIKELY	335	LIKELY
303	LIKELY	336*	LIKELY
304	LIKELY	337	LIKELY
305	LIKELY	338	LIKELY
306	LIKELY	339	LIKELY
307	LIKELY	340	LIKELY
308	UNCERTAIN	341	LIKELY
309	LIKELY	342	UNCERTAIN
310	LIKELY	343	LIKELY
311	LIKELY	344	LIKELY
312	LIKELY	345	LIKELY
313	LIKELY	346	UNCERTAIN
314	LIKELY	347	NONE
315	UNCERTAIN	348	UNCERTAIN
316	UNCERTAIN	349	UNCERTAIN
317	LIKELY	350*	UNCERTAIN

* Educational potential exists if the coded initiator, "equipment fault known or suspected," refers to either improper equipment, or equipment that failed as the result of inadequate maintenance. It is probable that education would not be a productive countermeasure for other aspects of equipment failures.

Initiator Code	Alternative for Education Potential	Initiator Code	Alternative for Education Potential
351	LIKELY	384	LIKELY
352	UNCERTAIN	385	LIKELY
353*	UNCERTAIN	386	LIKELY
354	LIKELY	387	LIKELY
355	UNCERTAIN	388	LIKELY
356	UNCERTAIN	389	LIKELY
357*	UNCERTAIN	390	LIKELY
358	LIKELY	391	UNCERTAIN
359	UNCERTAIN	392	LIKELY
360*	UNCERTAIN	393	LIKELY
361	LIKELY	394	LIKELY
362	NONE	395	LIKELY
363	UNCERTAIN	396	LIKELY
364*	UNCERTAIN	397	LIKELY
365	UNCERTAIN	398	LIKELY
366	UNCERTAIN	399	LIKELY
367	UNCERTAIN	400	LIKELY
368	UNCERTAIN	401	LIKELY
369	LIKELY	402	LIKELY
370	UNCERTAIN	403	LIKELY
371	LIKELY	404	LIKELY
372	LIKELY	405	LIKELY
373	LIKELY	406	LIKELY
374	LIKELY	407	LIKELY
375	LIKELY	408	LIKELY
376	LIKELY	409	LIKELY
377	LIKELY	410	LIKELY
378	LIKELY	411	LIKELY
379	LIKELY	412	LIKELY
380	LIKELY	413	LIKELY
381	LIKELY	414	LIKELY
382	LIKELY	415	LIKELY
383	LIKELY	416	LIKELY

* Educational potential exists if the coded initiator, "equipment fault known or suspected," refers to either improper equipment, or equipment that failed as the result of inadequate maintenance. It is probable that education would not be a productive countermeasure for other aspects of equipment failures.

Initiator Code	Alternative for Education Potential
417	LIKELY
418	LIKELY
419	LIKELY
420	LIKELY
421	LIKELY
422	LIKELY
423	LIKELY
424	LIKELY
425	LIKELY

APPENDIX P. ANALYSIS OF ACCIDENT-INVOLVED OPERATOR CHARACTERISTICS

(Previous analysis from Pleasure Boat Collision Education, Wyle Laboratories, 1978)

Demographic information was collected for the boat operators who were involved in those accidents in the major cause group. These were the fatal collision accidents which involved either a major accident cause or a major associated factor, including causes involving the operator's visual inattentiveness in a situation where the other boat/object should have been visible (Cause Codes 113, and 221 through 229) and the associated factors: reckless or malicious operation, excessive speed for conditions, operator alcohol consumption, operator inattention, and operator fatigue. The characteristics were selected as being relevant to subsequent decisions for the educational program concerning choices of mass media and educational methods. The boat operator characteristics selected for identification and analysis were: sex, age, occupation, formal education, formal boating courses, boat operating experience, and marital/parental status. The analysis of the boater profiles was conducted in two stages: identification of demographic characteristics for boaters in the selected collision cause groups, and the determination of whether certain characteristics departed from those of the boat operator population in general.

The identification of the operator demographic characteristics involved the tabulation of all available information for each characteristic as it was given on the copies of BARs provided by the U. S. Coast Guard Research and Development Center for the Safe Loading-Operator Study. New tabulations and additional statistical testing were required for the presentation of demographic information in a summary format. In order to determine the possible differences between the accident operator group and the population of recreational boaters, comparisons were made on characteristic by characteristic bases. The Nationwide Boating Survey (NBS) was consulted for statistics concerning the population of recreational boaters (Reference 2). The comparison between the two groups was based on the rationale that if systematic differences did emerge, it might be argued that persons of the specified demographic group have differential risks for accidents. Comparisons were made only when there was sufficient data for analysis.

Comparison of Collision Accident Operators and NBS Recreational Boaters

Analyses to determine possible differences between the accident boat operators (those operators associated with the major causes and human factors) and the NBS recreational boaters were conducted for operator sex, age, age for male operators only, boating experience, and formal boating education. These characteristics were selected on the basis of the availability of sufficient data for analysis from the BARs. Formal education of operators could not be compared to any national norms since this information was not available from the accident data.

Sex of Operators

There was some departure from NBS for the proportionate number of female operators reported in the collision accident profile. NBS indicates that the overall boating operator population contains 75.1% males; 94.7% of the collision accidents involved male operators. The frequencies and percentages for these comparisons are presented in Table 1.

TABLE 1. COLLISION OPERATOR AND NBS OPERATOR SEX

	NBS OPERATOR POPULATION	COLLISION OPERATOR SAMPLE
Males	12,287,731 (75.1%)	36 (94.7%)
Females	4,082,771 (24.9%)	2 (5.3%)

$(\chi^2 = 7.86;\ \chi^2(1) = 3.84,\ p < 0.05)$

Computation of the chi-square statistic using the "goodness of fit" procedure indicated that the difference in sex ratio between NBS population and this sample was significant at the 0.05 level of probability ($\chi^2 = 7.86$; χ^2 (1) = 3.84). It may be concluded that the proportion of male operators involved in fatal collisions is greater than the proportion of male operators in the general boating population.

Age of Operators

The mean operator age reported in the collision accident group was slightly lower than that of operators listed in NBS. The NBS mean age and standard deviation

were 34.2 yrs and 15.5 yrs, respectively, as compared to 30.4 yrs and 13.9 yrs* in the collision operator profile. The distributions of ages for both groups are presented in Table 2. The class intervals selected for the data were those given in NBS. A chi-square "goodness of fit" test was used to determine whether the age distribution of the collision operator profile was statistically different from the age distribution of NBS operators. Because the class intervals in Table 2 were too small to obtain minimum required theoretical frequencies for the test, the intervals were combined from nine intervals to five. The combined data are presented in Table 3. The chi-square test yielded a value of $\chi^2 = 5.04$, which is not statistically significant at the 0.05 level (χ^2 (4) = 9.49). The null hypothesis that the mean age of the collision operator population was the same as that of the NBS boat operators was tested using the t statistic. The result was also not statistically significant at the 0.05 level of confidence ($t = 1.64$, $t(35) = 2.03$). Consequently, there was no reason to conclude that there is a significant difference between either the age distributions or the mean ages of the operators involved in fatal collisions and all recreational boat operators.

TABLE 2. OPERATOR AGE DISTRIBUTIONS
(COLLISION AND NBS PROFILES)

AGE (YEARS)	COLLISION OPERATOR PROFILE		NATIONWIDE BOATING SURVEY (NBS)	
	Number of Operators	Percentage	Number of Operators	Percentage
Under 12	0	0	577,127	3.5
12-15	3	8.3	928,899	5.7
16-19	6	16.7	2,020,183	12.3
20-25	5	13.9	2,363,356	14.4
26-30	9	25.0	2,035,444	12.4
31-40	6	16.7	2,932,781	17.9
41-50	2	5.6	2,726,306	16.7
51-60	4	11.1	1,648,709	10.1
Over 60	1	2.8	1,137,697	6.9
TOTAL	36*	100.0	16,370,502	100.0

* Age was unknown for two operators.

TABLE 3. COMBINED INTERVALS FOR OPERATOR AGE DISTRIBUTIONS (COLLISION AND NBS PROFILES)

Age (Years)	COLLISION OPERATOR PROFILE Number of Operators	NATIONWIDE BOATING SURVEY (NBS) Number of Operators
0-19	9	3,526,209
20-30	14	4,398,800
31-40	6	2,932,781
41-50	2	2,726,306
Over 50	5	2,786,406
TOTAL	36	16,370,502

($\chi^2 = 5.04$; $\chi^2 (4) = 9.49$, $p > 0.05$)

Male Operator Age for Collision and NBS Operators

Since the preceding analyses indicate that male operators may have a higher risk for collision accidents, a further comparison was made to determine whether there was an age difference between males in the collision group and NBS. The two male age distributions are presented in Table 4. Again, the class intervals were too small to obtain the minimum required theoretical frequencies for a chi-square "goodness of fit" test; so they were combined as in the previous comparison. The combined data are presented in Table 5. The computed chi-square value of $\chi^2 =$ 7.01 was not statistically significant at the 0.05 confidence level (χ^2 (4) = 9.49). This indicates that the two age distributions are not different. An additional comparison was made between the mean ages for the two groups. The t statistic was used to determine if the mean age of the male collision operators, 30.0 years, standard deviation of 14.0 years, was statistically different from the mean age of the male NBS operators, 35.3 years, with a standard deviation of 15.8 years. The computed t value was statistically significant at the 0.05 confidence level ($t = 2.21$; $t(33) = 2.03$, $p < 0.05$). The difference between the two means was 5.3 years. Thus, it appears that on the average, the male collision operators are somewhat younger than the general population of male boat operators.

TABLE 4. MALE OPERATOR AGE DISTRIBUTION

Age (Years)	COLLISION OPERATORS Number of Male Operators	COLLISION OPERATORS Percentage	NATIONWIDE BOATING SURVEY (NBS) Number of Male Operators	NATIONWIDE BOATING SURVEY (NBS) Percentage
Under 12	0	0	436,124	3.6
12-15	3	8.8	609.705	5.0
16-19	6	17.7	1,311,872	10.7
20-25	4	11.8	1,730,060	14.1
26-30	9	26.5	1,554,923	12.7
31-40	6	17.7	2,170,372	17.7
41-50	1	2.9	2,116,470	17.2
51-60	4	11.7	1,372,263	11.2
Over 60	1	2.9	985,942	8.0
TOTAL	34	100.0	12,287,731	100.0

TABLE 5. MALE OPERATOR AGE DISTRIBUTION (COMBINED INTERVALS)

Age (Years)	COLLISION OPERATORS Number of Male Operators	NATIONWIDE BOATING SURVEY (NBS) Number of Male Operators
0-19	9	2,357,701
20-30	13	3,284,983
31-40	6	2,170,372
41-50	1	2,116,470
Over 50	5	2,358,205
TOTAL	34	12,287,731

($\chi^2 = 7.01$, χ^2 (4) = 9.49, $p > 0.05$)

Operator Boating Experience

A comparison of the number of hours of boating experience for primary boat operators in the collision group and those listed in NBS produced no readily observable differences. At this point, it should be noted that NBS operator experience pertains to the primary boat operator of the "family" surveyed rather than

experience given for all boat operators in the household.* The effect of this shift in emphasis in the NBS data will very likely inflate the experience given for all recreational boaters, at least when these hours of experience are compared to the accident boat operator experience. The primary operators of boats will accumulate more experience in boating than others in the household, while the collision accidents in question occurred to operators regardless of whether they were the primary operators of the household or less frequent operators in the household. A systematic bias in the results might favor an overestimation of the experience in the NBS group or an underestimation of the experience of the accident operator group. However, it remains that primary operators, being exposed to boating for a longer period of time, also have increased their chances for the occurrence of an accident simply as a function of exposure time. In analyzing the data, a conventional assumption will be made: that such biases are counteractive (i.e., they cancel each other out) and will contribute only to variabilty of the distributions. Operators reported as having 2 to 4 years of experience were included in the 100-500 hrs category; operators reported as having five years of experience were included in the greater than 500 hrs category. The distribution of relative experience in hours of boating for operators in both groups is shown in Table 6. In the collision profile, the same number of boaters had over 500 hrs as had 100 to 500 hrs of experience; more boaters in NBS had experience in excess of 500 hrs than in other experience categories. However, computation of the chi-square "goodness of fit" test indicated that any differences in the distribution are not statistically significant at the 0.05 level of probability (χ^2 = 1.98; χ^2 (3) = 7.82). Again, there is no statistical reason to expect that there is any difference between NBS boat operators and operators involved in fatal collisions with respect to experience. It is noteworthy that 76% of the collision profile operators had over 100 hrs experience, and about 38% had over 500 hrs. experience. Apparently, with the present data, the causes and factors associated with these collisions cannot be linked to operator inexperience.

---

*The primary operator in a boating household was defined as "that operator with the most operating time in 1973" in the instructions provided to respondents in the NBS survey.

TABLE 6. OPERATOR EXPERIENCE DISTRIBUTION (COLLISION AND NBS PROFILES)

Experience (hours)	COLLISION OPERATOR PROFILE		NATIONWIDE BOATING SURVEY (NBS)	
	Number of Operators	Percentage	Number of Operators	Percentage
< 20	2	6.9	872,042	9.4
20-100	5	17.2	2,263,599	24.4
100-500	11	37.9	2,541,911	27.4
>500	11	37.9	3,599,494	38.8
TOTAL	29	100.0	9,277,046	100.0

($\chi^2 = 1.98$; $\chi^2(3) = 7.82$, $p > 0.05$)

★ U.S. GOVERNMENT PRINTING OFFICE: 1979 -627-823/1921